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ABSTRACT

The project documented in this report identified barriers researchers encounter in gaining access to--i.e., identifying, acquiring, handling, and using--published information and measured the seriousness of the more significant barriers. Fifty-one barriers were identified, and a method of measuring their seriousness was developed. Thirty of the more important barriers were selected, and their seriousness was measured on the basis of an interview questionnaire administered to 60 researchers in the human and natural sciences. The major findings were as follows: (1) researchers experience many different types of barriers; (2) the effect of barriers is usually detrimental; (3) the seriousness of barriers remains constant over time and does not decrease; (4) the library or information system is exposed to the barriers and incorporates them from outside its operational environment; (5) the library or information system, which essentially exists to promote access to published information, also causes barriers; and (6) the method for measuring the seriousness of the barriers seems sound. The primary recommendations include identifying barriers within library or information systems so they can be removed or reduced; having researchers, editors, and publishers assume more responsibility in ensuring fewer barriers to their published materials; and activating library and information systems in the information life cycle. Sixty-one tables and 9 figures supplement the text. (385-item bibliography) (SD)

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Information barriers: identification and seriousness

D.E. Haag

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Report BIN-12

Information barriers: identification and seriousness

D.E. Haag

Pretoria
Human Sciences Research Council
1989

Project BNAD01V008

Report based on the thesis submitted to the Faculty of Arts, University of Pretoria, in partial fulfilment of the requirements for the degree D.Phil. (Library and Information Science).

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SAMEVATTING

Die gebruik van gepubliseerde inligting vorm 'n integrale deel van die navorsingsproses. Versperrings wat toeganklikheid tot gepubliseerde inligting vertraag, steur of vernietig, kan navorsing nadelig belemmer, kan lei tot frustrasie en verkwisting van mannekragg en kan onnodige duplisering van navorsing veroorsaak. Sulke versperrings behoort geïdentifiseer te word sodat hulle, sover praktiès moontlik, verwyder of beperk kan word.

Die doel van hierdie verslag is om eerstens versperrings te identifiseer wat navorsers ondervind in hulle toegang tot gepubliseerde inligting, d.w.s. versperrings wat hulle teenkom in die identifisering, verkryging, hantering an gebruik van gepubliseerde inligting, en tweedens, om die erns van die belangriker versperrings te bepaal.

Een-en-vyftig versperrings is geïdentifiseer: 'n Metode is ontwikkel om die erns van versperrings te bepaal. Dit behels 'n kombinasie van die versperringskomponente, naamlik frekwensie, effek op die verkryging van inligting en effek op die navorsingprojek. Die geprojekteerde erns van 'n versperring word daardeur aangedui of dit verminder, konstant bly of vermeerder.

Dertig van die belangriker versperrings is vir meting geselekteer en die erns daarvan bepaal met behulp van 'n onderhoudvraelys aan 60 navorsers in die geestes- en natuurwetenskappe. Die gemete versperrings word in volgorde van erns gelys.

Die vernaamste bevindings kan soos volg opgesom word:
- Navorsers ondervind verskeie en ernstige versperrings.
- Die uitwerking van versperrings is gewoonlik nadelig.
- Die erns van die versperrings bly oor die tyd konstant.
- Die biblioteek- en inligtingsisteem is blootgestel aan, en neem versperrings oor van buite sy operasionele omgewing.
- Die biblioteek- en inligtingsisteem veroorsaak ook versperrings.
- Dit blyk dat die metode vir meting van die erns van versperrings bruikbaar is.

Die volgende is die vernaamste aanbevelings van die verslag:
- Versperrings in die biblioteek- en inligtingstelsel moet deurlopend geïdentifiseer word, en sover moontlik verwyder of ten minste verminder word.
- Navorser, redakteurs en uitgewers behoort groter verantwoordelikheid te aanvaar vir die skepping van versperringsvrye gepubliseerde inligting.
- Biblioteek- en inligtingkundige sisteme behoort meer aktief in die inligtingsiklus op te tree.

SUMMARY

The use of published information forms an integral part of the research process. Barriers which either delay, disturb or destroy access to published information can affect research detrimentally, can lead to frustration and wasted research effort and can cause unnecessary duplication of research. Such barriers should be identified so that as far as is possible they can be either removed or reduced.

The purpose of the project is firstly to identify barriers researchers experience in gaining access to published information, i.e. barriers they experience in identifying, acquiring, handling and using published information and, secondly, to measure the seriousness of the more important barriers.

Fifty-one barriers are identified. A method of measuring the seriousness of a barrier is developed, using a combination of components of such barriers, namely frequency of occurrence, and the effect of the barrier on the acquisition of information and on the research project. The projected seriousness of a barrier is determined on the grounds of whether its seriousness is decreasing, constant or increasing.

Thirty of the more important barriers are selected and their seriousness measured on the basis of an interview questionnaire conducted with 60 researchers in the human and the natural sciences. The measured barriers are presented in order of seriousness.

The major findings can be summarized as follows:
- Researchers experience many different and serious barriers.
- The effect of barriers is usually detrimental.
- The seriousness of barriers, over a period of time, is not decreasing but remains constant.
- The library and information system is exposed to and incorporates barriers from outside its operational environment.
- The library and information system, which essentially exists to promote access to published information, also causes barriers.
- The method of measuring the seriousness of barriers seems sound.

The following are the main recommendations of the report:
- In a library and information system, barriers should be continuously identified so that, as far as is feasible and practical, they can be either removed or reduced.
- Researchers, editors and publishers should assume more responsibility in the generation of information stage to ensure barrier-free access to published information.
- Libraries and information systems should become more active in the information cycle.

INTRODUCTION

The purpose of the introduction is to outline what this project on information barriers wants to research or to find out. The introduction:

- introduces the setting of the research topic
- traces the origin of the research project
- specifies the statement of the research problem and the research objectives
- provides the necessary description and interpretation of relevant terms and concepts
- list the abbreviations used, and
- briefly outlines the contents and arrangement of the report.

THE SETTING OF THE RESEARCH TOPIC

On 18 April 1775 the critic, essayist, poet and lexicographer Samuel Johnson stated: "Knowledge is of two kinds; we know a subject ourselves or we know where to find information upon it" (Boswell, 1949, vol. 1:558). Today unfortunately, the finding of information for the forming of knowledge can apparently no longer be as readily assured as in 1775, for it seems to have become a more complicated process impaired by a variety of barriers, i.e. constraints or obstructions which can make the access to information more difficult, time-consuming, inefficient, and even ineffective.

Effective and efficient access to published information is an integral and essential part of the research process. As sound decisions are most likely based on available and accurate information, barriers which either delay, disturb, or destroy access to published information can affect research detrimentally, can lead to frustrations and wasted research effort and can cause unnecessary duplication of research. Such barriers should be identified so that as far as is feasible and practical, they can be either removed or reduced.

THE ORIGIN OF THE RESEARCH PROJECT

The project originates from two stimuli: the more important stimulus is the personal interest aroused in barriers due to repeated observations gathered from experience in providing a service in a library and information system (LIS) for researchers. Despite constant improvements, it seems that the barriers in locating, acquiring and using published information have not been significantly alleviated - indeed some of the solutions based on new technology have imposed new levels of complexity and have introduced other barriers. These observations, gathered from 1967, were comfirmed by the 1970 survey on user problems (University of the Witwatersrand, 1971a) and by continuous subsequent discussions with researchers in various disciplines and in different types of LIS.

The approach of the professional literature to the question of barriers indirectly creates the second stimulus to the project. While some of the contributions indicate that most LIS users are 'fairly satisfied', reservations are being expressed about the efficiency of provided services (Mason, 1969; Willemse, 1984:5). No longer can information needs be satisfied by the formal information system (Disch, 1976). Other contributions indicate that users are dissatisfied with present methods of obtaining information (Advisory Council..., 1965:96). Only very few users desire no change to the present system (Slater, 1984a:84). Problems with research collections seem to remain, if not becomming worse (Slater, 1988:231). While no LIS can be self-sufficient, several contributions to the literature focus on the low success rate of from 40 % to 65 % to get required publications (Slater,

1963:14; Morse, 1968; Tagliacozzo, et al., 1970:233; Schofield et al., 1975; Saracevic et al., 1977:14; Ciliberti et al., 1987; Voorbij, 1988:200-202). Although the success rates cannot be compared, the older contributions mention more favourable success rates, and it seems as though the failure rate is increasing:

The many use and user studies conducted during the 1960's and 1970's can be seen as an attempt to improve the understanding of library users. These studies were however primarily intended for survey and not for remedial purposes. But although the literature constantly urges improved information accessibility, the contributions seem to place greater emphasis on improved and larger information storage capacity, greater mechanization and speedier retrieval rather than on the identification and elimination of barriers. The literature does, therefore, not adequately reflect the seriousness of the problem of barriers as gained from experience and from discussions with researchers. What is now required is a user study on barriers so that the remedial process to remove or reduce barriers receives a foundation on which to operate.

STATEMENT OF THE RESEARCH PROBLEM AND THE RESEARCH OBJECTIVES

An advanced level of information service is recognized as a prerequisite for scientific and technological progress (Pachevsky, 1982:115). The LIS, as important source of published information, partakes in this process. Thus barriers which interfere with the operation of the LIS to make information optimally accessible can adversely affect research and scientific progress. Working on the premise that if the present successes of the LIS are maintained, information accessibility for research should improve if the inherent barriers are removed or at least reduced.

The removal or reduction of barriers is however, hampered by three obstacles:

a) Lack of overview studies on barriers

The professional library and information science literature, while dealing with varying success and on different levels with several isolated and unrelated barriers, e.g. the 'foreign language barrier' or the 'information explosion barrier', as can be seen in Appendix 1 on page 170, fails to provide a comprehensive overview of all the barriers experienced by researchers using published information or the facilities and services of the LIS of their institution.

If the extent of barriers experienced by researchers when obtaining access to published information, i.e. the barriers experienced in the identifying, locating, acquiring, handling and using of published information, is to be properly understood, it is imperative that these barriers are identified and listed.

b) Lack of details on barriers

Very little detail is known of individual barriers, e.g.:

- To what extent and how frequently are they experienced by researchers?
- Are they serious, and if so, how serious?
- What are the effects of barriers, e.g. on the acquisition of information process or on the research project itself?
- What is the trend of experienced barriers, are they decreasing, remaining constant or increasing in frequency or intensity?

As the literature does not provide these details, they will have to be investigated during the project.

c) Lack of method to establish the extent of barriers

In order to express the extent of barriers, e.g. their frequency, effect or trend, and in order to allocate a priority order in which sequence barriers should be removed, barriers should be measured according to some scale. Although Polushkin & Zhdanova (1970) and Perath (1978) have attempted to measure barriers, a satisfactory method is however lacking and must first be compiled.

From these three research problems it becomes apparent that barriers cannot only be analysed conceptually, but that an empirical study is required. Furthermore, because of the absence of other studies on this topic, this study takes on the form of an exploratory study in a relatively unknown field. The three research problems also indicate the required three broad research objectives:

- the identification of barriers researchers experience in getting access to published information
- determining the seriousness of the more important of the identified barriers
- arranging these barriers according to seriousness.

DESCRIPTION AND INTERPRETATION OF RELEVANT TERMS AND CONCEPTS

The terms and concepts involved in a study of barriers experienced by researchers when gaining access to published information primarily center around the following:

- information
- library and information system
- information barrier
- research
- the researcher
- the cycle of published information in research

To relate these terms to the project and to promote common understanding rather than to impose some prescriptive meaning, they are defined, described and, where necessary, interpreted. A list of the abbreviations used is also included.

Information

The origin of the word 'information' can be traced through the Latin noun 'informatio' to the verb 'informare' which, according to Seiffert (1971:26-27) meant "giving form" or "giving shape", and according to Yuexiao (1988:480) meant a "process to communicate" or "something to be communicated". Aleady in this dichotomy the elusive and contoversial concepts of information emerge, and it is no wonder that the literature presents many different interpretations - Yuexiao refering to a reference that estimates that more than 400 definitions are presented.

Some authors interpret 'information' from a specific point of view. Shannon & Weaver (1949:8) see it as an important object of communication, Farradane (1979:13) as the "written or spoken surrogate of knowledge" and Shera (1970:96) as the building blocks of knowledge. Yovits et al. (1981a:187) see 'information' as data of value in decision making, while to Brillouin (1962:1), Wersig & Meyer-Uhlenried (1969:202; 1970:16) and to Ozog (1979:310) it reduces uncertainty. Otten & Debons (1970:89), Harmon (1975:93; 1984:193-198) and Oettinger (1980:191) correlate 'information' to energy. Other authors identify several aspects, e.g. Diemer (1971:106) identifies three aspects: the process of transmitting, the contents being transmitted and the results of the transmission. Rathswohl (1975:21-25)

identifies four concepts: commodity, process, state of knowing, and environment, and Beling & Wersig (1973:13-17) and Wersig & Neveling (1975:130) identify six: matter, knowledge, message, meaning, effect, and process (Blom, 1980:21-24).

In spite of all these contributions and in spite of the many overviews of the different definitions and interpretations (Wellisch, 1972:170-176; Wersig, 1973:11-56; Wersig & Neveling, 1975:129-132; Rathswohl, 1975:21-25; Roberts, 1976:249; Belkin, 1978:55; Blom, 1980:19-25; Mayer, 1982:29; Meijer et al., 1988:64-83), the only certainty to emerge is that there is no agreed definition (Wellisch, 1972:157; McGarry, 1981:15) and that 'information' "is not a singular concept, but a serial of concepts with complex relationships" (Yuexiao, 1988:480). Thus to simplify the issue for arriving at an operational interpretation for this project, the most generic definition, coming from philosophy and meaning "knowledge for the purpose of taking action" (Ackoff, 1959:226-230; Mason & Mitroff, 1973:475) is adopted, the 'action' for this project being the application of information for the research process.

As concerns the sources of information, the project limits the meaning of information resources. Whereas the interpretation of Horton (1974:1) embraces the full range of producers, suppliers, handlers and distributers of information, and includes information in all its forms, documented and undocumented, raw data as well as evaluated information, the project is only concerned with documented information, including data bases, for which the LIS is traditionally responsible.

Library and information system

Information systems are meant to support problem solving activities (Kunz, 1981: page 1-2) and supporting the information function is the reason for the existence of the research library. All its activities are attuned to acquire and make information available (Malan, 1978:38), to facilitate optimum and effective access to information, and according to Meijer (1982:16), to support decision making and scientific and technological progress throught the optimum provision of publications. The task description of the librarian as described by Zastrau (1973:13) is most suited for this project, for it is broadly but aptly described as the removal of barriers between the record and the user.

Several authors have categorized the functions of the LIS, for example Boon (1984:90) and Meijer et al. (1988:17-27). The latter author categorizes the functions into basic and supporting functions, basic functions being those that are fairly unique to an organization and which typify an organization, the supporting functions being those performed to assure the effective execution of the basic functions. The following basic and supporting functions are identified:

Basic functions

- *Collection development:* Preselection, selection, acquisition, weeding, relegating and restoration.
- *Information processing:* Cataloguing, classification, indexing, abstracting and translating.
- *Reference and information retrieval:* Drawing up user profiles, current awareness, reference, packaging and repackaging of information, user guidance, and information dissemination.
- *Document delivery:* Loans and interlending.

Supporting functions

- *Supporting services and management:* Personnel, buildings, furniture, equipment, research, and professional education, as well as the func-

tions that are common to several of the basic functions, e.g. computerization.

The report later selectively adopts this functional arrangement for working with barriers, e.g. for arranging the identified barriers.

Information barrier

The professional literature, already alerted to the problems encountered in the LIS, is increasingly using the word 'barrier' to denote an obstruction which impedes or even prevents access to information, access to published information, access including the identification, tracing, acquisitioning, handling and use of information.

Engelbert (1974a:51) describes information barriers as appearances of the objective reality which impede or prevent the flow of information from the generator or the information system to the addressee ("Erscheinungen der objektiven Realität, die den Informationsfluss vom Informationserzeuger bzw. der Informationseinrichtung zum Adressanten der Information ... behindern bzw. verhindern"). Feinman et al., (1976:623) define an information barrier as "a condition which creates a discrepancy between an 'idealized norm' and actual information behavior in a specific situation." Agreeing with both these definitions, this project sees an information barrier arising whenever there is a variance between the ideal and the actual accessibility to published information in the research environment, the ideal being that which can be reasonably expected - for example a publication in the LIS should be available but not missing, or the depth of indexing should conform to the level required. While barriers, in the context of information flow, generally prevent access to information, almost all barriers are at least partially permeable (Havelock, 1969:page 2-4) and usually allow at least partial or delayed access, e.g. information subject to political boycotts can be acquired through a third source. This project accepts the permeable nature of barriers and thus interprets barriers as impediments that can impede, obstruct, delay, or prevent access to published information.

The presence of a barrier in the LIS or in an information system can be either intentional or unintentional. Intentional barriers are purposefully introduced, usually to retain certain information within a system to the exclusion of another system, e.g. a restriction of the number of publications that might be taken out on loan from the LIS, or copyright restrictions. Unintentional barriers are incidental to the information system, e.g. interlending delays or gaps in the collection.

As a barrier either obstructs, delays, disturbs, impedes or even destroys, partly or wholly - with regard to either quantity or quality - the optimum accessibility of information, it can have many different effects, ranging from 'no effect' through to a 'decrease of project quality'. While the effects can generally be expected to be detrimental, this does not necessarily imply that the barrier poses a problem - for example the barrier of information delay will not present a problem if unimportant information is delayed, but will certainly present a serious problem when vital and urgently required information is involved. Figure 1 shows the three different ways in which information can be accessed - without a barrier, through a barrier with no effect, and through a barrier with effect. A barrier starts when an obstruction, however slight, is encountered, i.e. when the barrier threshold is exceeded.

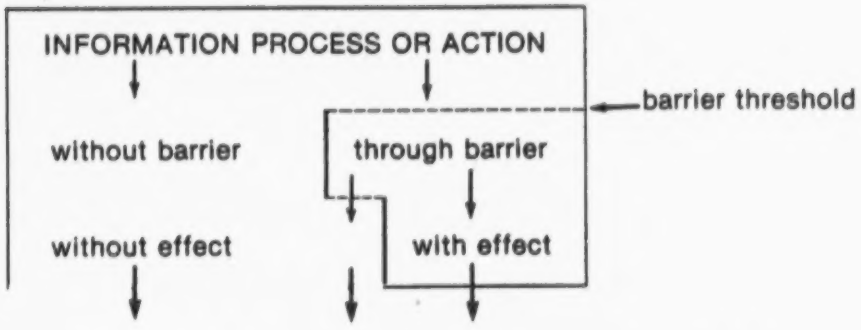

Figure 1: Access to information without barriers or through barriers

As the term 'information barrier' is rather lengthy, it is shortened to 'barrier'.

Research and published information

The third revised edition of the *Shorter Oxford English Dictionary* defines 'research' as "an investigation directed to the discovery of some fact by the careful study of a subject; a course of critical or scientific inquiry." The aims of research, according to Kluth (1970:24-25), are "die Entdeckung des Unbekannten, die Offenbarung des Verborgenen, die Aufklärung des nur Geahnten, die Manifestierung des Unbestimmten" (discovery of the unknown, disclosure of the concealed, elucidation of the suspected, declaring of the undefined).

Research is ideally conducted according to a basic pattern, Mouton & Marais (1985:22-23), for example, identifying the following five typical steps:
- selection of the research topic
- formulation of the research problem
- conceptualization and putting into operation
- collecting of data/information
- analysis and interpretation of data/information.

Boshoff (1988:1), adopting the cyclic approach of research from Bailey (1982:10), identifies five steps in the research process, i.e.:
- choice of the problem and formulation of the hypothesis
- formulation of the research design
- data collection
- data analysis
- interpretation of results.

Many other outlines of the research process are described in the literature, e.g. Blom (1980:77-81; 1983,13-17). For the purpose of this thesis the processes as described by Mouton & Marais and Boshoff concisely and adequately cover the essential stages of the research process and are therefore accepted.

The consultation of published information forms an integral and essential part of research, and although the information handling pattern changes during the different stages of the research process (Garvey et al., 1974:117-119; White, 1975:346), it can be consulted in most, if not all stages (Blom, 1980:119-127; Garvey, 1975:491; Haag, 1978:12-14). Thus published information forms the basis, the ingredients, as well as the product of research (Kreuz, 1975:51).

The researcher and published information

For the purpose of this project, the researcher is both the user of existing information and the producer of new information created by research involving the study of published information and by experimentation. As the project is only interested in barriers researchers experience in obtaining access to published information, the description of the researcher excludes the research assistant who is not usually a user or producer of published information and is consequently not exposed to information barriers as is the more senior researcher.

In consulting published information, the researcher may be involved in the following six activities:

- search for information indicators or information sources
- selection of apparent suitable indicators or sources
- acquisition of information
- evaluation of obtained information
- utilization of information
- publishing of new information.

The cycle of published information in research

The research process involving the utilization of published information from the LIS by the researcher, together with information gathered from empirical evidence, can be seen as a cyclic process. It involves the identification, collecting, evaluating, using, generating and publishing of information, the cycle being repeated with the start of a new project. Its participants are the researcher, the publisher and the information source, usually the LIS.

Many authors have compiled cyclic or spiral diagrams to illustrate this cycle (Meyer-Uhlenried, 1967:227; Masson, 1969, Part 2 page 3; King & Bryant, 1971:2; Lancaster, 1977:3; Lancaster & Smith, 1978:368; Reisig, 1978:406-407; Appleyard, 1979:66; King, McDonald & Roderer, 1981:2; Meijer, 1982:23; Ononogbo, 1986:73; Meijer et al., 1988:75). This continuous and regenerative cycle of actions and participants is simplified in Figure 2.

Figure 2: The cycle of published information in research

Experience has shown that barriers are present in all three of these components. Details of which of these three components are covered by the project are outlined in 1.1.1.3.

ABBREVIATIONS USED

AEC	Atomic Energy Corporation
CSIR	Council for Scientific and Industrial Research
Dnk	Do not know
FID	International Federation for Documentation
HSRC	Human Sciences Research Council
INIS	International Nuclear Information System
ISBN	International Standard Book Number
ISO	International Organization for Standardization
ISSN	International Standard Serial Number
LIS	Library and information system(s)
MRC	Medical Research Council
RAU	Rand Afrikaans University
RSA	Republic of South Africa
SAIMR	South African Institute for Medical Research
SDI	Selective dissemination of information
UP	University of Pretoria
UWITS	University of the Witwatersrand.

In the text frequent reference is made to other numbered sections in the text. The sections referred to are not preceded by the word 'section', only the number is indicated, e.g. 'as outlined in 5.2.4, the...'. However where reference is made to many sections and Tables, the word 'section' is use to facilitate reading and understanding.

CONTENTS AND ARRANGEMENT OF THE REPORT

The aim of the research project prescribed that the following three broad objectives will have to be investigated:

- the identification of barriers which obstruct access to published information
- determining the seriousness of barriers
- arranging these barriers according to seriousness.

The contents and the arrangement of the report follows this sequence:

Chapter 1: Research methods

A method of identifying barriers, and a method of measuring their seriousness as experienced by a group of researchers, called the target group, is developed.

Chapter 2: Identified barriers

The barriers identified are listed and briefly described.

Chapter 3: Selection of identified barriers

The most important of the identified barriers are selected for determining their seriousness.

Chapter 4: Selective characteristics of the target group

The characteristics of the researchers involved in measuring the seriouness of barriers are briefly described.

Chapter 5: Analysis of collected data

The collected data indicating the seriousness of barriers is presented, and the barriers arranged in order of seriousness. This is the main part of the report.

Chapter 6: Synthesis and interpretation of the collected data

The collected data is synthesized and categorized. The research methods used to attain the objectives of the project are evaluated, the potential benefits of the project indicated, an outline of conclusions drawn and of recommendations.

The report is rounded off with ten appendixes and a list of about 380 quoted publications.

CHAPTER 1: RESEARCH METHODS

Purpose and scope of Chapter 1

Whereas the introduction outlined the aim of the project, this chapter determines which methods and techniques will be used to attain the research objectives. It outlines and motivates the methods selected or developed for achieving the objectives of the project, i.e. for identifying barriers, for measuring the extent of barriers, for arranging the barriers in sequence of seriousness, and indicates the sequence in which the methods are to be applied.

The development of the research methods did not necessarily proceed in the sequence as described in this chapter, for several issues could only be finalized as the project advanced. The description of the methods used could have been presented in the chapter in which they were developed, but would then have been dispersed throughout the report. It was therefore preferred to present the methods together, with the advantage that the rest of the report follows the structured sequence as laid down in this chapter.

The approach to achieve the three tasks mentioned in the first paragraph of this chapter is through the following steps:

Methods of identifying barriers

- determining criteria for identifying barriers
- selecting sources for identifying barriers.

Methods of measuring the selected barriers

- designing a method of measuring barriers
- determining the instrument for measuring the seriousness of barriers and the method of collecting the data
- determining the study sample
- determining the method of processing the data.

1.1 METHODS OF IDENTIFYING BARRIERS

1.1.1 Criteria for identifying barriers

The identification of barriers experienced by researchers should proceed according to criteria determined by the aim of the project. After considering which types of barriers are relevant for the project, the following five criteria for including or excluding barriers were determined. These are:

- coverage
- seriousness
- barrier component of the information cycle
- formal as against informal information sources
- personality traits of the researcher.

1.1.1.1 Coverage

The introduction indicated that the literature has to date not compiled a comprehensive listing of barriers. Such a compilation would be useful, and the identification and the listing of barriers should be as comprehensive as the project demands and allows.

Contributors to the literature have already provided some barriers with a name, e.g. 'the foreign language barrier'. To promote coverage, the barriers already provided with a name should be identified. This will also promote the standardization of names, for different names have been given to the same barrier.

1.1.1.2 Seriousness

As the study does not concentrate on one or on several barriers but tries to present an overview of barriers, it cannot afford to identify all the smaller or lesser barriers or all the barriers that form part of the broader and more general and more serious barriers. Thus, while striving at comprehensiveness, the project has to concentrate on the identification of the more serious barriers.

This does, however, not imply that the less serious barriers are ignored. Frequently they form part of broader barrier issues and can be collectively accommodated under those barriers. As example, the barrier caused by the restriction placed on the number of loans, the number of interloans that can be applied for at the same time, the length of the loan period, number of periodicals allowed on circulation or the number of permanent loans allowed, can all be accommodated under one barrier - the barrier of unhelpful procedures, rules and regulations.

An additional factor for giving preference to identifying the more serious barriers, is that the number of barriers identified will invariably determine the method selected for measuring their seriousness. The more barriers are identified the less time and attention can be given to each barrier.

1.1.1.3 Components of the information cycle

This project addresses the manager of the LIS for removing or reducing barriers researchers experience in gaining access to published information. Thus it is imperative that those barriers of the information cycle that affect the LIS are also identified by this project.

It appears that the LIS is exposed to and inherits barriers inherent in the other two components of the information cycle i.e. from the researcher as generator/user and from the publisher, and that of these barriers exert a detrimental effect on the LIS. One weakness of published information is, that although it is of interest to all, and each one of the three participants in the information cycle has his own responsibilities and part to play, there is no co-ordinating responsibility or feedback opportunity. But the exposed manager of a LIS, in order to protect his services and in the absence of market-related consumer feedback, can and should become more involved in the total information cycle and its barriers. He is, after all, the only link in the information cycle able to perceive all the components and their barriers.

This project thus covers the barriers, as far as they can be identified by researchers, in all three components of the information cycle.

1.1.1.4 Formal as against informal information sources

The information sources of every researcher include both formal sources (books, journals, reports or proceedings as made accessible by LIS), and informal sources (discussions or correspondence with fellow researchers). As the latter operates outside the environment of the published information cycle (Allen, 1976:2-1), and as the manager of an LIS has usually no direct interest in or control over it, the barriers experienced in the informal information sources are not relevant for the project, and are, therefore, not identified.

1.1.1.5 Personality traits of the researcher

Various personal characteristics, psychological and professional attributes are positively related and affect the approach and use of information. Höglund & Persson (1976:188) and Summers, Matheson & Conry (1983:77) mention education, experience, position, status, age, personality traits and language skills. To this can be added dedication and perseverance, and the attitude towards information as an important input to research.

While some of these traits could present a barrier to obtaining access to published information, the barriers they might cause are largely based on personality differences that cannot be considered as part of the information system and the information cycle and are, therefore, not identified.

1.1.2 Sources selected for identifying barriers

To ensure that the comprehensive coverage as determined in 1.1.1.1 is attained, the following sources should be consulted or involved in the indicated sequence:

- professional literature
- researchers
- managers of LIS
- other research organizations, and
- personal professional experience.

The motivations for including these sources for identifying barriers follow:

1.1.2.1 Professional literature

Reflecting the cumulated published professional activities and experiences, the professional literature can identify more barriers than can be identified from individual experiences, and should be consulted.

As the first contributions dealing specifically with barriers were those of Polushkin & Zhdanova (1970) and Engelbert (1971a, 1971b), the literature should be searched from that date. As indicated in 1.1.1.1, as many barriers as possible named in the literature as 'barriers' should be traced and listed. In addition, some of the many use and user studies of the 1960's refer to 'problems', 'obstacles' or 'grievances' and as some of these studies present a potential source for identifying additional barriers, they should also be consulted.

Besides being an important source for identifying barriers, the literature also has to be consulted to

- establish whether a study dealing with an overview of barriers has been completed or is in progress
- help to find indications of what constitutes a barrier, i.e. when does a barrier start
- take cognicance of which barriers are identified and dealt with
- help to establish workable definitions
- note contributions relevant to the study
- determine whether these contributions have offered solutions to the problem of barriers
- identify which methods exist for determining the extent or the seriousness of barriers
- place the project in perspective to other contributions on the issue of barriers.

The literature should be consulted through the following resources:

- relevant abstract and index journals, including *DIALOG-LISA* searches
- circulating periodicals
- *Register of investigations into librarianship in Southern Africa* (Haag, 1986)
- *Statistical research data base*, compiled by the Centre for Social Research Data of the HSRC and comprising statistical data generated from HSRC projects.

1.1.2.2 Researchers

Whereas the literature on barriers largely consists of contributions from librarians and not from researchers, it is likely that the contributions will reflect or emphasize the more important and the more fundamental or system barriers, but not all the barriers experienced by researchers or the users of the LIS. Thus the researcher, in his interaction with the LIS, will be able to supplement this list by identifying not only additional barriers but barriers of a more practical kind, e.g. barriers with LIS procedures, rules and regulations. Such barriers are never reported in the literature. Furthermore, it is the researcher alone who is qualified to comment on the relevancy, reliability, timeliness, and usability of information obtained from the LIS. Thus researchers represent an authoritative additional source for identifying barriers and should be consulted. Furthermore, experience has shown that the international abstracting and indexing services do not cover the South African literature satisfactorily, and an authoritative additional source such as local researchers must be included.

A quick and easy method of identifying barriers is by diary method, i.e. to provide a select group of researchers with forms on which they could record the barriers they experience over a to be determined period of time. The following method was used: Five librarians at five academic and research institutions in the Pretoria and Johannesburg area, in consultation with the author, selected sixteen active researchers (with a minimum of four years research experience). After informing these researchers of the purpose and the importance of the exercise, and after securing their cooperation telephonically, they were requested by covering letter to record on the supplied form (Appendix 2 on page 176), the barriers they experienced over the next four to six weeks and the barriers experienced in the past.

In order to promote response and maintain anonimity from the managers of the respective LIS, the completed forms were to be returned directly to the author in the supplied envelope.

1.1.2.3 Managers of LIS

Whereas the application of the previous two methods (searching of the literature and consultation of researchers) was expected to primarily identify system and service barriers, the manager of an LIS would be able to identify barriers experienced by researchers pertaining to all three components of the information cycle, i.e. barriers in the generator/user; publisher/publication; and in the LIS. Through his experience, the barriers he could identify would supplement the previous two sources and are important to the study. The contributions of the managers is enhanced as LIS users, as gathered from experience, are reluctant to indicate information access problems and that suggestions for improvements usually originate with staff or management, but not from users (White, 1979:81).

The method selected for identifying additional barriers from managers was to compile a list of the barriers already identified from the literature and from the sixteen researchers (described in 1.1.2.1 and 1.1.2.2) and to distribute this list to a select group of managers with the request for confirmation of the listed barriers, for comments and for identification of additional barriers. Twelve heads of important libraries (three academic, four research, one government and one national library) and one head of a Department of Librarianship and Information Science, all in the Pretoria and Johannesburg area, were arbitrarily selected for this purpose.

1.1.2.4 Correspondence with research organizations

Some of the more important overseas organizations might currently be investigating barriers without this being mentioned or traced in the professional literature. Thus in order to

- establish whether such investigations were being conducted;
- to verify that this project was not duplicating one of their projects, and to
- possibly identify additional barriers,

some of the prominent overseas research organizations should be approached. Thirteen such organizations were arbitrarily selected for this purpose (as listed in Appendix 3 on page 177).

1.1.2.5 Personal professional experience

The author, in occupying senior positions in academic, national, and special libraries, and from undertaking an extensive study tour of 20 British and 20 Germany libraries, became very aware of the barriers researchers experience in gaining access to published information. Thus if additional barriers not identified from the four preceeding sources can be identified from personal experience, these should also be listed.

From the start, the author himself experienced barriers in gaining access to published information for this project, and in the spirit of the theme of the project, thought it instructive to keep a record of these barriers. Also, this record might reveal additional barriers not previously identified.

1.2 METHODS OF MEASURING THE SERIOUSNESS OF BARRIERS

1.2.1 The need to measure the seriousness of barriers

For the purpose of this project, it is not sufficient if the barriers experienced by researchers are only identified. Their seriousness also has to be determined. This seriousness cannot be determined from the literature, for it

- does not identify all the barriers;
- does not in all instances express the seriousness of barriers;
- does not express the seriousness in a standardized way; thus no comparisons between barriers can be made.

Thus the seriousness will have to be determined, i.e. measured so that barriers can be arranged in order of seriousness and thus reflect the priority order in which they should be removed or reduced.

1.2.2 The need to design a method of measuring seriousness

A method of measuring barriers for the project has to be designed because of two reasons:

- Firstly, as far as could be established, the literature does not report a suitable method of measuring barriers. Two methods were devised by Polushkin & Zhdanova (1970) and Perath (1978), but are not applicable for measuring all barriers. Polushkin & Zhdanova, who relate a barrier mainly in terms of language access, use the language distribution of references in an article or publication to reflect the extent to which the information barrier is overcome. The height of the barrier (H) is is indicated by the formula **H = P/Q-1**
  where P = percentage language distribution in the discipline, Q = percentage language distribution of references in the article. If H is equal to zero or is negative, the barrier is virtually negative. This formula cannot be adopted because it can only measure one (the language) barrier, and cannot reflect the effects or the trend of barriers. Perath also concentrates on measuring one barrier, that of 'logopolution' (caused by the production of information that cannot reach its user). He uses message length, assimilation time, message efficiency, message availability, message response and message dispersal as participating factors. For each of these a separate formula is defined or developed and combined into a complicated formula expressing degree of utility. This formula can also not be used as it is applicable to only one type of barrier and cannot indicate the effects or the trend, i.e. seriousness.

- Secondly, other methods cannot be applied, i.e. existing methods of evaluating LIS are not suitable for measuring the extent or seriousness of barriers. While the literature abounds with contributions on how to evaluate LIS, the customary methods invariably measure effectiveness, efficiency, retrieval or success rate. But success rate or error analysis are not the same as barrier rate, for the former cannot reveal the full extent of delays, effort, cost or frustration involved in achieving the success rate, nor can it indicate or measure the effects of barriers or the implications of these effects - these indicators being required by the study.

1.2.3 Designing a method of measuring seriousness

Measuring the seriousness of barriers is more difficult than is realized at first glance, for, on closer inspection, many factors emerge that influence the reliability and validity of the method. These factors must be taken into consideration, not only when developing the method, but also when collecting and evaluating the readings obtained by applying the method of measuring barriers.

The following eight factors could be identified:

- The research level of the researcher should be taken into consideration, for research in a well-established topic, which relies more on the formal information sources, i.e. publications, is subject to more and different barriers than is advanced research, which relies more on informal information sources.
- While some barriers are temporary and are active only during certain stages of research, e.g. during the literature survey stage, other barriers are more permanent, e.g. limited available time to consult publications. The research stage in which a barrier is primarily active or inactive affects the reading, because a temporary barrier measured during its 'inactive' stage will provide either no reading or too low a reading.
- The frequency count of a barrier is determined by the frequency of exposure. Consequently the intensive user of an LIS will report a higher

frequency count than the occasional user if the count is not expressed as a percentage of total use.

- Users not always being aware of all the barriers, their presence may go unnoticed. Users may also accept barriers as an inherent part of the information cycle, not realizing that barriers can possibly be removed or reduced.
- Users react differently to the same barrier. While some users are indifferent or insensitive, others may over-react.
- Users are inclined to recall only the most serious barriers and their most serious incidences.
- It is difficult to measure the effect of some barrier. The effect of not receiving vital information, for instance, can only be surmised or at most gleaned from the expected effect.
- Sampling of the barrier incidences to be measured presents a problem. Should the most recent incidence of a particular barrier be measured, the last three incidences, all incidences, only the most serious incidence, or the most common incidence?

As a starting point to develop a method of measuring the extent or seriousness of barriers, the use of a five-point semantic differential scale ranging from, e.g. 'not serious' through 'serious' to 'very serious' could be considered, or the four point scale of Summers, Matheson & Conry (1983:77) comprising the indicators 'no problem', 'very little problem', 'considerable difficulty', and 'extreme difficulty'. But this method cannot serve the purpose of the project satisfactorily, for subjective indicators cannot yield either reliable nor valid data. What is a 'very serious' barrier to one researcher might be a 'not serious' barrier to another researcher. Interpretations of what is to be measured also differs - one researcher will interpret seriousness in terms of cost, another in terms of effort and yet another in terms of time or effect on the project.

Thus as the extent or seriousness of a barrier cannot be satisfactorily measured by one scale, the only alternative is to refine the scales and to use a combination of scales to develop a new scale or method. This can be achieved by

a) identifying the components or characteristics of a barrier;
b) selecting or developing a method of measuring these components individually, and
c) synthesizing the methods of measuring the components into a method or formula for the measuring of barrier seriousness.

1.2.3.1 Identifying the barrier components of seriousness

On analyzing a barrier, five distinct components that are common to every barrier and affect barrier seriousness can be identified. The seriousness of a barrier is firstly determined by the value of the information obstructed by the barrier and secondly by the duration of that barrier. Thirdly every barrier exercises an effect , which can be seen as the product of the above components of information value and duration. Fourthly, a barrier has a frequency record which, together with the effect component, indicates the present seriousness of the barrier. As a barrier, over a period of time, either decreases, remains constant or increases in seriousness, it also has a certain trend which can indicate the predicted seriousness of a particular barrier.

These five components all contribute towards barrier seriousness to a greater or lesser extent:

- The component information value is an important indicator of seriousness, since the effect of a barrier on 'unimportant' information cannot

be as severe as the effect that the same barrier exercises on 'important' or 'vital' information. Closer inspection shows that this component contains at least two subcomponents: relevance and reliability. Relevance implies the suitability, applicability and aptness of information, for example with regard to a research project. Thus the more relevant the information, the greater its potential value. Reliability concerns the integrity, accuracy and the currentness of the information and these contribute directly to the value of information.

- The component duration (the length of time required to remove a barrier, or the length of time a barrier that cannot be removed remains active) is not as important a component as information value. It nevertheless allows distinctions and comparisons to be drawn between barriers, for a short or temporary exposure to the effects of a barrier may not be as serious as a lenghtly or permanent exposure to the same barrier.

- The component effect (which for the purpose of this project is interpreted in terms of the type of effect, e.g. 'delay of the project' or 'increases cost' or 'eliminates usability of information' and should not be confused with the seriousness of the effect), is another important component, for the seriousness of a barrier is directly determined by the effect and subsequently by the implications of that effect.

- The component frequency is another important indicator of barrier seriousness, for the more often a barrier is experienced, the more frequent the exposure to the effect of that barrier and the more serious the cumulated consequences of that effect.

- The component trend is also an important indicator of seriousness, for managers of LIS should not only be aware of the present seriousness of barriers, but also whether the barrier is decreasing, remaining constant or increasing.

These five components do not operate in isolation of one another but interact in widely divergent intensities. If there should be a relation between these components, it would appear that the component information value and the component duration contribute directly towards the component effect (but not towards the component frequency), while the component effect together with the component frequency indicate the present seriousness of a barrier. Combined with the component trend they indicate the predicted seriousness of a barrier. The synergic action of the barrier components is illustrated in Figure 3.

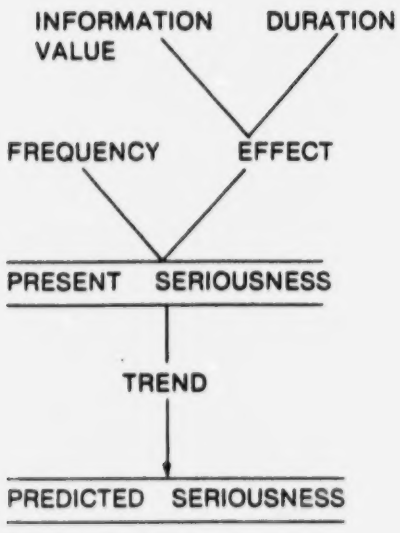

Figure 3: Synergic action of barrier components

1.2.3.2 Measuring the identified barrier components of seriousness

The next step in developing a method of measuring the barrier seriousness is the selection of a suitable method of measuring each component. If the flow of the components as illustrated in Figure 3 is adopted, i.e. that barrier seriousness is compiled from the components frequency and effect, the need to measure the component information value and the component duration falls away, for these are adequately represented and accommodated in the component effect. Both components, if included in the required formula, would be extremely difficult to measure, indeed a satisfactory instrument for measuring the value of information has not been devised (Engelbert, 1970:35, 38,39). Furthermore, such a measuring scale would be too sensitive in comparison to the other scales. Thus the proposed method of measuring present barrier seriousness involves only the components frequency and effect, while the proposed method of measuring the predicted seriousness involves the components frequency, effect and trend.

Measuring the barrier component frequency

Barrier frequency can be readily measured, the most obvious methods being to record

a) whether a particular barrier is experienced or not; and if so,
b) how often, out of the total number of contacts, a particular barrier is experienced. This can, for example, be expressed in terms of the interval percentage scale, shown on the left in Figure 4;
c) when the barrier was last experienced, shown in the semantically differentiated ordinal scale on the right in Figure 4. Whereas the individual responses on this scale are not by themselves indicative, the cumulative categorized frequency count reflects a more meaningful representation of the distribution.
d) how often each of the users has experienced a specific barrier over a certain period of time, e.g. a year.

For the purpose of the project methods a), b), and c) were used selectively.

FREQUENCY (%)	
0	Do not know
1	0 %
2	1 - 20 %
3	21 - 40 %
4	41 - 60 %
5	61 - 80 %
6	81 - 99 %
7	100 % always

FREQUENCY (when last)	
0	Do not know
1	Never
2	Longer than a year ago
3	During the last year
4	During the last 6 months
5	During the last 3 months
6	During the last month
7	During the last week

Figure 4: Response options for measuring barrier component frequency

Of the three selected methods, the first two, ie. methods a) and b), are particularly suitable for measuring the unimportant and the more frequently experienced barriers. The third method is more suited to measuring the more important and the more infrequent barriers and is also useful where users are not likely to give an accurate indication of frequency. The fourth method, i.e. method d), was not adopted, for during the pilot study the researchers appeared hesitant and unsure when asked to recall the number of times a particular barrier had been experienced during a certain period of time, e.g. during the last year.

Measuring the barrier component effect

Barrier effect can be readily measured by either

a) using a semantically differentiated scale, anchored at each end by a bipolar adjective, e.g. 'no effect' and 'very serious effect', or by a progressive semantically differentiated ordinal scale as suggested for measuring the component frequency, or by
b) recording the responses against a list of possible effects, e.g. 'no effect', 'increases effort required' or 'increases the cost', etc. as shown in Figure 5.

The scale mentioned under b), being less subjective and yielding more objective results than the scale mentioned under a), was adopted for the project. Furthermore, the pilot study had shown that the effects of the barrier, with regard to the effect on the acquisition on information and the effect on the project, should preferably be measured separately.

BARRIER EFFECT ON THE ACQUISITION OF INFORMATION	
0	Do not know
1	No effect
2	Delays the acquisition of information
3	Increases effort required to obtain information
4	Increases cost of information
5	Eliminates accessibility/usability of information

BARRIER EFFECT ON THE PROJECT	
0	Do not know
1	No effect
2	Increases effort required
3	Increases cost of project
4	Delays the project
5	Decreases the quality of the project

Figure 5: Response options for measuring barrier effects

The types of effects outlined in Figure 5 are arranged in an increasing order of seriousness.

Measuring the barrier component trend

Barrier trends can be measured by indicating semantically whether there is either a decrease, consistency or an increase in barrier seriousness. A three-point scale, with weights 1 for decreasing, 2 for constant, and 3 for increasing seriousness, was found accepable and was adopted.

1.2.3.3 Synthesizing the method of measuring barrier seriousness

The scales selected to indicate frequency, effect on the acquisition of information, effect on the project, and trend, being synergic, are combined into one reading to indicate barrier seriousness. The proposed combination into a formula could be:

Present seriousness: s = f + e(1) + e(2)

Projected seriousness: s = f + e(1) + e(2)+ t.

where:
s = seriousness
f = frequency of the barrier
e1 = effect of the barrier on the acquisition of information
e2 = effect of the barrier on the research project
t = trend of the barrier.

The values can also be multiplied, i.e. s = f x e(1) x e(2) + t, provided that the sign before the t is retained so as not to negate the cumulated values should t = 0.

Of these formulae, the first one using the addition is preferred. Substituting random readings from the scales, the formula gives a barrier seriousness reading of s = 5 + 3 + 3 + 1 = 12 out of a possible maximum of 20 (7 + 5 + 5 + 3), showing that the barrier is indeed active.

This indicated the seriousness of a barrier experienced by one researcher.

To indicate the seriousness as experienced by more researchers, weighting (Line, 1982:99-100) is used to calculate the average weighted index. Thus the values of the various response options in the multiple choice options as shown in Figure 5, are multiplied by the number of responses against that option, and the total of all the options divided by 5. This is also applied for the multiple choice options of frequency, effect, and trend. An example of such a calculation is presented at the beginning of Chapter 5.

The formula can thus, with certain limitations, reflect the overall seriousness of an identified barrier, allows for a comparison of seriousness to be made between barriers and suggests the priority order in which these should be attended to.

However desirable and simple the formula $s = f + e(1) + e(2) + t$ to measure the seriousness of barriers might appear, two objections advise against its unqualified adoption in the practical environment of the LIS.

Firstly, there is no indicated direct or indirect relation between the various components, i.e. frequency and effect and trend function in isolation of one anther. The combining of these components into one formula serves no practical purpose for managers of LIS, for a barrier seriousness index of, say, 12 (unlike the reading on a thermometer or in an intelligence quotient test) remains meaningless until such a formula has been universally adopted and implemented. What the manager needs is an indication of the extent of every barrier component, for each separate reading not only indicates the approach by which that barrier can or will be removed or reduced, but determines the priority order in which that barrier will be removed or reduced. However, a frequently experienced barrier of minor effect and decreasing trend with a barrier seriousness index of, say 12, should preferably not be equated by the formula to a seldomly experienced barrier with severe effects and an increasing trend, also with a barrier seriousness index of 12.

Secondly, combining the different scales into one formula is strictly speaking not statistically acceptable because

- the intervals between the ordinal scales are not equal in either the own scale or between scales;
- the values of the scales are not comparable, i.e. a reading of 3 on the frequency scale is not equal to a reading of 3 on the scale for the measuring of effect; and
- the scales do not have the same number of intervals, e.g. a scale for frequency comprises seven intervals, the scale for effect four intervals and the scale for trend only three intervals.

Considering that this project deals with measurement techniques used by the human sciences which does not use units of counting but relative counting to bring out the degree of difference, the objections listed under the second reason could be removed or accommodated in various ways, thus allowing the formula to be used. For the purpose of this project however, the three components are treated as individual components in measuring barrier seriousness, not because the formula is not suitable, but because, as will be indicated in Part 2, the priority order in which barriers should be removed or reduced can be more readily and accurately be determined if the separate readings of the four components (i.e. f, e(1), e(2) and t) are retained.

1.2.3.4 Alternative methods of measuring seriousness

The preceding method of measuring barrier seriousness by formula involves four questions, i.e. testing for

- presence of the barrier
- the effect of the barrier on the acquisition of information
- the effect of the barrier on the research project
- the trend of the barrier.

If applied to establishing the seriousness of every barrier, this method is a lengthy process that will severely limit the number of barriers that can be tested, e.g. by questionnaire within the limited time available during an interview. But because not all the barriers are so important that they need to be tested by the above method, and in order to accommodate and measure as many barriers as possible, an alternative shorter method of measuring the 'less-serious' barriers should also be devised.

The following four alternative shorter methods are suitable for measuring the presence or extent of barriers considered arbitrarily from experience to be not so serious:

- Testing for the presence of the barrier only, e.g. whether interlending loans are delayed;
- Testing for presence of the barrier, and if positive, determining when last was it experienced, e.g. whether interlending loans are delayed, and if so, when last were they delayed;
- Testing for presence of the barrier, determining the percentage frequency or extent, e.g. whether interlending loans are delayed, and if so, how frequenty;
- Testing for presence of the barrier and if positive, whether it presents a barrier, e.g. whether interlending loans are delayed, and if so whether this present a barrier or not.

To summarize, the 'less serious' barriers are measured by one of these methods, and the 'more serious' barriers by the method outlined in 1.2.3.3.

The next step is to find a suitable data collecting instrument that can accommodate these methods of measuring the seriousness of barriers as experienced by researchers.

1.2.4. Determining the instrument for collecting data on the seriousness of barriers

The researcher is the best equiped source for indicating the seriousness of barriers experienced in obtaining access to published information and the data collecting instrument should thus be attuned to the researcher. An outline of the criteria applicable to the data collecting instrument and the method of developing the instrument follows:

1.2.4.1 Criteria for the data collecting instrument

A data collecting instrument should preferably comply to most or all of the following criteria:

- ensure reliable responses;
- be easily understood by the respondent;
- ensure a high return rate;
- ensure that every respondent is presented with the same questions in the same sequence;
- facilitate processing of the collected data, preferably by computer;

- be flexible to accommodate follow-up questions;
- be able to collect data from a dispersed group of respondents;
- be simple and fairly quick to compile and to administer;
- be economical and inexpensive.

These criteria are also suitable and acceptable as requirements of the data collecting instrument for this project. Furthermore, the following characteristics of the project emphasize some of these criteria and impose additional criteria to be met by the instrument:

- The sampling frame is large and dispersed.
- It can be expected that a relatively large amount of data will be collected and that intricate correlations will have to be drawn.
- The nature of barriers is complex as is the method developed for measuring them. It can, therefore, be envisaged that the respondent will require detailed explanations and instructions, and that it will be necessary to make sure that these are understood by the respondent.
- The method of measuring barriers has not been tested before and no evaluation of the method that can serve as guideline is available.
- While some barriers occur frequently, others occur rarely.
- The data collecting instrument is an unique opportunity to gather additional details from the practical environment and to broaden the knowledge on barriers. Its potential advantages should, therefore, be fully exploited.
- Because of limited travelling funds, the data was to be collected only in the Pretoria and Johannesburg area.
- The data would be collected by the author.

1.2.4.2 Selecting the data collecting instrument

The literature (Neubauer, 1970:197-198; Goldhor, 1972:116-136; Lancaster, 1974:62-69; Berdie & Anderson, 1974; Kunz, Rittel & Schwuchow, 1977; Ford, 1979:56-69; Busha & Harter, 1980; Line, 1982:48-78; Berdie, Anderson & Niebuhr, 1986:13-21 Schnetler, 1989:12-39) describes and recommends several methods of collecting data, e.g. by observation, records analysis, case study, by survey, by mail questionnaire, interview (structured or unstructured; by telephone or in the presence of the respondent; interview by group or individual interview), by diary method, by inspection of records, by observation (informal or unobstrusive), or by a combination of these methods.

After analysing the suitability of each of these methods, the interview method using a structured questionnaire, complying to the first list of criteria, emerges as the most suitable method of measuring barriers. This data collecting method provides the neccesary personal contact between respondent and collector of data, enhances reliability and validity of the responses, can collect data from a sufficiently representative sampling frame without sacrificing quality. In short, it assures the necessary control over the collecting of data on as complex an issue as barriers. As personal contact is important it was decided that the interviews would not be conducted by telephone. Also, to assure individuality of the responses, the interviews would be conducted individually and not by group of respondents. To ensure uniformity the questionnaire would be structured.

The mail questionnaire was rejected because, being a rather unpersonal method of collecting data, and depending on the cooperation of the researcher, the response rate might be low and not high enough to yield representative data - for example the return rate for HSRC questionnaires without reminders is about 40 %, for those with reminders about 75 %, while researchers in medicine are not considered good respondents. Furthermore,

the mail questionnaire cannot meet the interaction required between the respondent and the collector of data, cannot attend to the questions of the respondent, cannot accommodate follow-up questions to test relevance reliability or the accuracy of the responses, has a limited capacity to broaden the knowledge on barriers and generally deprives the collector of data to get the 'feeling' of the research topic and the 'barrier environment' in which the respondent conducts his research. Also data might be omitted or incorrectly completed. The diary method was rejected because of the possibility that it might not be consistently maintained, its usually high drop-out rate, and the prospect that the diary would not be able to collect data on the more infrequently experienced barriers unless it was maintained over a very long period, possibly for a whole year. The inspection of LIS records method cannot be applied because the records can only be used to indicate the extent of some delays, e.g. the delays in ordering new publications, but cannot indicate whether or not this delay presents a barrier or not. The observation method, i.e. observing a researcher in his interaction with published information and recording details of barriers experienced during observation, was rejected because it demands long observation periods and the infrequently experienced barriers might not be included. As only a few researchers could be covered, the collected data would not being representative.

1.2.4.3 Compilation, design, and layout of the questionnaire

Several factors and requirements determined the design, contents and layout of the questionnaire:

- As the questionnaire was to be completed by the interviewer during an interview, explanatory details and instuctions could be given verbally and need not be included in the questionnaire.
- In compliance with recommendations in the literature that the questionnaire should be kept "short" (Behr, 1983:151; Berdie, Anderson & Niebuhr, 1986:53; Schnetler, 1989:78), forty-five to sixty minutes were allocated for the interview. This allocation restricted the number of barriers that could be included in the questionnaire and also determined which of the designed method of measuring a barrier was applied.
- The critical incident technique (Martyn & Lancaster, 1981:45-52) should not be incorporated into the questionnaire. The purpose of the project is to investigate the broad issues of barriers, e.g. frequency and combined seriousness, and not to investigate all aspects about a recent barrier incident. For the same reason, and because of time restrictions for collecting the data from the respondent, the application of the failure analysis method (Menzel, 1966:62-64; Lancaster, 1979:126, 137; Martyn & Lancaster, 1981:45-47) whereby each failure is individually investigated, must also be rejected.
- Because of the sensitive nature of the responses, and in order to elicit frank responses from the respondents, the responses of the individuals in the report would remain anonymous.
- The response fields should be prepared for data capturing on 80 column punched cards and for computer processing.
- The questionnaire should be prepared in English as well as in Afrikaans.

The questionnaire should be composed of three parts:

- research background of the respondent and details of available LIS and their use thereof
- type and seriousness of barriers experienced
- provision for the respondent to identify additional barriers.

A more detailed motivation and description of these three sections follows:

- Research background of the respondent and details of available LIS and their use

  Besides identifying in which institution and in which discipline the respondent is active, this section should collect data on the respondent's involvement with research, e.g. the extent of research experience or the amount of time spent on research. The purpose of these qualifyers is to establish whether there are significant differences between the type and extent of barriers experienced by different researcher categories. In this regard, for example, the literature suggests improved current awareness capacity with increasing experience (Lynam, Slater & Walker, 1982:54-55) and variations in opinion and knowledge of the LIS (Van Dalsen, 1986:238), while Evans & Line (1973:214) show that those researchers at the University of Bath that had the closest contact with the staff of the LIS rated those services most highly. This could imply that they had less barriers than the researchers with less LIS contact.

  This section should also gather some details of the available information services provided by the respective organizations and the use made thereof by the researcher, again to establish whether there is a meaningful correlation, for example, between the availability and use made of services and the type and extent of barriers experienced.

- Type and extent of barriers experienced

  This section, the main part of the questionnaire, should be designed to record details of the barriers that are experienced by the study sample. For measuring the 'more serious' barriers, the method as devised in 1.2.3.1 to 1.2.3.3 (measuring frequency, effect on the acquisition of information process, effect on the project and the trend of the barrier) should be used. For testing the 'less serious' barriers the shorter methods devised in 1.2.3.4 should be applied so that as many barriers as possible can be accommodated within the available interview time of 45-60 minutes.

- Provision for the respondent to identify additional barriers

  For comprehensive coverage of barriers, the respondent should be granted the opportunity to identify barriers additional to those included in the questionnaire. Thus this section of the questionnaire will collect details of those barriers identified in Chapter 2 but which could not be included in the questionnaire because of time constraints or might identify barriers not previously identified.

Only these global details can be furnished here. For more details about the contents of the questionnaire, the copy of the questionnaire, Appendix 4 on pages 177-187, should be consulted.

The draft questionnaire was compiled and tested by pilot study, the purpose of the latter being to

- confirm that researchers can indeed provide data on barriers;
- confirm the usability of the method developed for measuring barriers;
- ensure that the information requested is available or collectable;
- identify and eliminate any problems in understanding or in responding to the questions;
- ensure that the questionnaire could be completed within the time limit of 45-60 minutes;
- test the layout and ensure that the space provided for the answers is adequate;
- provide for possible additional questions and eliminate unnecessary or insignificant questions; and

- identify additional barriers for possible inclusion in the final version of the questionnaire.

The first pilot study was conducted with seven researchers meeting the criteria of the sampling frame as identified in 1.2.5. The questionnaire was also inspected by the Opinion Survey Centre of the HSRC, and after making the necessary changes, was tested with six other researchers.

1.2.5 Determining the target group

The following criteria were adopted as guideline for determining the target group:

- Respondents from both the natural and the human sciences should be included so that any meaningful differences in the type and extent of barriers experienced, if present, would be revealed.
- If all the different sciences were to be covered by the study, the sample group would be very large. As this would be impossible to handle by questionnaire interview, the number of sciences has to be limited to a maximum of four.
- The sciences to be covered should be selected according to their present and potential importance in the national infrastructure and the availability of a sufficiently large sampling frame from which to compile the target group.
- To facilitate processing of the collected data, the number of respondents selected from each of the sciences should be equally large.
- Because of economic considerations, the target group would be compiled only from organizations in the Pretoria and Johannesburg area.
- The target group should be equally composed of researchers in academic and in research organizations.
- If possible, the different types of LIS (centralized or decentralized; with or without subject librarians) should be represented in the organizations selected so that any meaningful differences, if present, will emerge. Thus not one specific LIS or type of LIS, but several types are studied in order to arrive at findings and statements that can be applied to more that one situation and LIS.
- The researchers participating in the project should be intensive users of published information, but not necessarily be users of the the LIS. The reasons for considering non-users is that, as Slater (1981:29-31) shows, they may prefer not to use the LIS because its inherent barriers. The report also wants to identify these barriers.
- Only researchers active in research should be considered for inclusion in the target group. The composition of the target group would therefore be purposeful rather than by random sampling, i.e. by purposive sampling (Williamson et al., 1977:111; Bailey, 1982:99; 1987:94-95). The reason for this criteria is that some researchers are 'more qualified' than others to express their opinion on barriers. It can be expected that the active researcher handles more published information and is thereby more frequently exposed to barriers than is the researcher who is not so active in research or who does not often use published information. For this project, which is exploratory, authoritative data gathered from the more dynamic researcher is considered more important and more relevant than the representative data collected from randomly selected researchers. Thus purposive sampling, which can also attain fairly representative data from a relatively small target group, is preferred to random sampling as the most suitable method for compiling the target group.

  The researcher qualifying for inclusion should also have a minimum of four years of research experience, have at least a Masters degree or its

equivalent, should be willing to participate, and should have sufficient uninterrupted time available for the interview (45-60 minutes).

With these criteria and determinants in mind, the target group was compiled as follows:

- A sample of eighty researchers was initially thought to be sufficiently large and representative. During the pilot survey it was however noticed that the collected responses were fairly consistent and representative and that a target group of sixty researchers would suffice. A further important consideration for this reduction was that it would save time and expense.
- With a sample size of sixty, four disciplines could be covered, two in the natural and two in the human sciences, giving fifteen responses per discipline.
- The selection of disciplines was made from the priorities important for development as listed in the HSRC publication *Priorities for research on the development of Southern Africa* (Beukes, Maritz & Coetzee, 1985:6,7,10). The dissiplines selected were:
  - medicine
  - physics, particularly nuclear physics
  - education
  - sociology.
- The following three universities and three statutory research organizations were selected: Rand Afrikaans University (RAU), University of Pretoria (UP), University of the Witwatersrand (UWITS), Atomic Energy Commission (AEC), Human Sciences Research Council (HSRC) and the South African Institute for Medical Research (SAIMR). Researchers in the selected disciplines in the private sector and in industry could not be involved because of the lack of a suitable sampling frame.

For identifying and selecting the target group, the departmental heads of the respective disciplines at the selected organizations were contacted telephonically and informed of the project. If researchers complying to the criteria were available in the department concerned, the names of at least four such researchers was requested. Of these researchers were then contacted by telephone or visited between other interview sessions, the project outlined, an interview requested, the appointment made and the respondents encouraged to think about the barriers they had experienced or are experiencing. Without exception, all the researchers recommended by the departmental heads qualified as suitable candidates for the target group.

1.2.6 Collecting and processing the data

The interviews were conducted during July and August of 1985. At the start of the interview the respondent was again briefly reminded of the purpose of the interview, examples of typical barriers provided, the testing method of one barrier described (measuring frequency, effects and trend) and the anonymity and confidentiality of the responses stressed.

The questions on the questionnaire were read out to the respondent and the responses recorded by the interviewer. To facilitate the recording of the structured responses for barrier frequency and effects, the respondents were provided with sheets on which the possible responses as depicted in Figures 4 and 5 (1.2.3.2), were listed in large print. Most of the interviews lasted from forty-five minutes to about one hour.

The collected data was captured on 80 column punch cards and the dataset processed by the Computer Centre of the HSRC. A record layout was compiled and the dataset edited by the necessary programs to identify possible cod-

ing and punching errors, duplicate record numbers and missing cards and to cross check fields. After editing, straightforward frequency counts and a variety of two-dimensional table with row variables were compiled.

1.3 SUMMARY OF CHAPTER 1

To recapitulate, Chapter 1

- established that barriers would be identified according to the criteria of: comprehensive coverage, seriousness, all three categories in the information cycle, and in the formal, i.e. published, information sources.
- determined that barriers would be identified from a survey of the literature, by diary method from 16 researchers, from 13 managers of LIS, from correspondence with 13 overseas LIS and research organizations, and from personal experience;
- developed a main and alternative methods of measuring the seriousness of barriers;
- selected the questionnaire interview method as method of collecting from researchers data on the seriousness of barriers;
- determined the target group of 60 researchers; and
- selected the punched cards and computer processing method for processing the collected data.

The next step is to apply the selected method for the identification of barriers in the sequence as indicated.

CHAPTER 2: IDENTIFIED BARRIERS

Purpose, scope and arrangement of Chapter 2

In this chapter pertinent barriers are identified, according to the criteria and methods as developed in 1.1.1 and in 1.1.2, from

- the literature
- researchers
- managers of LIS
- research organizations
- personal professional experience
- the pilot study.

The identified barriers are presented in the above sequence because it is instructive to see which types of barriers are and which are not identified by the respective sources. Within these categories however the barriers are arranged by functional sequence of basic and supporting functions, as outlined on page 4 of the Introduction. The following other five guidelines are used for presenting the identified barriers:

- The listing is exclusive by source which identified the barrier, e.g. a barrier already identified from the literature is not listed again when identified by any of the other four sources.
- Some barriers form part of another barrier or barriers. Some barriers again are very similar to other barriers. The listing, committed to include all barriers already provided with an acceptable name will, therefore, contain some similar as well as some overlapping barriers, e.g. the 'political-ideological barrier' (the restriction on information exchange between ideologically opposed systems) can be seen as part of the 'ownership barrier' (the monopolistic retention of information within a system to the exclusion of other systems) and also as part of the barrier caused by judicial and legal stipulations restricting the distribution of information, e.g. through boycotts.
- The names of those barriers already known or identified by an acceptable name, e.g. the 'terminology barrier', are used for the heading in the listing. If a barrier is known by more than one name, e.g. the 'foreign language barrier', the most suitable or a suitable name is selected. Barriers without a name are provided with one which usually describes the nature or the effect of that barrier, e.g. the 'barrier of publishing delay'.
- Some barriers described in the literature are not in themselves barriers but are rather the results of one or more barriers, e.g. 'barrier of unnecessary duplication of research', which is the result of either weak information searching strategy, delay in acquiring information or some other reason. For comprehensiveness such 'barriers' are also identified.
- So as not to interrupt the continuity of the report, the description of the identified barriers is kept brief. Any indication of the seriousness of a barrier as reported in the literature is not included in the description but is reserved for Chapter 5 for comparison to the seriousness of the barrier as indicated from the data collected from the 60 interviews with researchers.

2.1 BARRIERS IDENTIFIED THROUGH THE PROFESSIONAL LITERATURE

As determined in 1.1.2.1, the professional literature from about 1960 would be consulted for identifying barriers researchers experience in gaining access to published information. The search was a lenghthy process because the term 'barrier' or its equivalents are seldomly used in titles of contributions to the literature and are subsequently not indexed in the relevant abstract and index journals. The relevant contributions mainly had to

be identified out of the text itself, particularly from contributions on library surveys and from use and user studies.

From the literature, the following 31 barriers could be identified:

2.1.1 Publishing delay

According to Balaban (1978:vii), Faraday in 1821 said that there are three necessary stages of useful research: the first to begin it, the second to end it and the third to publish it. Publishing delay is caused by delays incurred in the third stage.

Since new research is partly based on the findings of past research, it is imperative that research results be published without delay, as a barrier may arise when existing but as yet unpublished relevant results cannot be used because they are delayed in the publishing process. The researcher as user of published information experiences the barrier by not acquiring available information and keeping up with advances. Thus contributions which do not take the latest advancement into consideration loose relevance and potential purpose. Instead of being an advancement, they are outdated additional contributions (Bandara, 1988:96). For this reasons Dobrow (1969:214) estimates that the information value of a publication decreases by a third to a half respectively if publication is delayed more than one and a half to two years after completion of the research project. The researcher as author on the other hand experiences the barrier through the delay of his claim for priority and the distribution of his contribution. Since Dobrow's statement, the rapid distribution of research results has become even more critical because of the ever increasing advancement and speed of research.

Publishing delay is composed of two lags, the rejection lag and the publication lag. The rejection lag is the delay caused by rejection after submission and by manuscript revision; the publication lag is the time taken to referee, edit and publish the manuscript of a journal article, or the time taken to compile and publish an abstract and index journal.

The barrier caused by these two lags is called the 'barrier of publishing delay'.

2.1.2 Publication standards not used or inconsistently used

The effective use of information is enhanced by the adherence of the internationally accepted standards for presenting publications and information (Meyer-Uhlenried, 1967:234-235; Aschenborn, 1970:38; Haag, 1987).

For research publications all potential sources of confusion created because of a lack of accepted standards, or the lack of the acceptance of standards, or the acceptance of a variety of standards, should be avoided. The author, editor and publisher should promote, for example, the correct selection of the title, the inclusion of the abstract, the use of the International Standard Book Number (ISBN) or the International Standards Serial Number (ISSN), the correct compilation and inclusion of the index and the running title, the correct numbering of sections and pagination, standardized way of presenting bibliographic references (Meyer-Uhlenried, 1967:234-235; Mansfield, 1984), and the correct layout of their publications (Haag, 1987). If the use of these standards is either inconsistent or if they are not applied, a barrier may be experienced in the identification, retrieval and use of published information (Robertson, 1979; Sadowski, 1979; Rein, 1982; Haag, 1984:216).

This barrier is called the 'barrier of publication standards not applied'.

2.1.3 Repetitive information

Repetitive information is redundant or superfluous information. The fact that research uses and advances on the findings of previous research does not imply and justify the fact that previous research needs to be re-reported repeatedly, extensively commented on, interpreted, summarized, unnecessarily published in different versions in different journals and in different media, or even plagiarized.

A certain amount of repetitive information is however inevitable and also necessary. The author is expected to briefly place his research into the context of existing knowledge; terms and methods, though not new, have to be defined for the reader. Then different forms of the same information tend to appear in the various stages of the research and the publishing cycle, e.g. a preliminary oral or printed report might be issued, the information might be presented at a conference, circulated to colleagues or distributed as preprint before being published in a publication. Furthermore it might be translated. Engelbert (1976:7) mentions that because of different terminologies used by the different disciplines, authors are often obliged to publish the same findings in several publications, each contribution in the terminology adopted to the particular discipline.

A barrier may arise when, because of the extent of repetitive information, it becomes not so much more difficult but rather more cumbersome and time consuming to select the 'new' information from the repetitive information. Boon (1978:6-7) calls this the "problem of concealment".

The barriers that can arise because of the unnecessary repetition of information is called the 'barrier of repetitive information'.

2.1.4 Inaccurate and unreliable information

As researchers use the results of previous research, it is essential for scientific progress that newly published information be reliable and accurate. Unfortunately not all information can be taken as fact, as accurate or as reliable by virtue of its appearance in print. Unreliable, inaccurate, misleading and even false information is unintentionally and intentionally published - unintentionally because of errors in the research and publishing process, and intentionally by the fabrication and falsification of research results, possibly due to the pressure to publish quickly without proper verification, or because of the competition for research grants or promotion (Plagiarism..., 1980; Broad, 1981).

Unreliable and inaccurate information causes a barrier because it wastes the time and effort of the researcher who pursues leads only to find them wrong. Thus it is understandable that in the study by Summers et al., (1983:83) the respondents placed authoritativeness, accuracy and objectiveness as the most important characteristic of an information source.

This barrier is called the 'barrier of inaccurate information'.

2.1.5 Obsolescent information

Published information can contain information which, through the rapid advancement of science, is superseded and has lost its usefulness and validity (Griffith et al., 1979:179; Motylev, 1981:4).

Using citation or reference analysis, the declining use of 'older' information is well documented in the literature, e.g. by Burton & Kebler, 1960; Brookes, 1970; 1972; Avramescu, 1979. But the decreasing use is measured and analysed as though and implying that this decrease of use is accompanied by and reflects the declining utility, usefulness and even validity of such information. Such indicators cannot satisfactorily reflect the extent of obsolescence or the value of information over its span of 'useful' life, for there are far too many reasons for the logical and natural changes in the use and utility of information (Herner, 1956:84; Price, 1965:235; Line & Sandison, 1974:283-284; 313-316). That older (not automatically obsolescent) information is less used than new information does not in itself present a barrier to the researcher - indeed, it contains the advantage of exposure to less information, helping to negate the detrimental effects of too much available information.

The declining utility, usefulness and validity of superseded and obsolescent information, however, does present a barrier because, if used, it can distort or even invalidate research findings.

This barrier is called the 'barrier of obsolescent information'.

2.1.6 Inferior information quality

The research literature contains contributions of varying quality ranging from the superior to the mediocre and even the substandard (Garvey, 1979:107-108).

The quality of published information is largely determined by referees of periodicals and other publications, and the rejection rate of manuscripts can be high, up to ninety per cent for history (Hills, 1972:5), while McCartney (1977:475) mentions a rejection rate of eighty per cent with the top periodicals in Sociology. While this does, to a certain extent, help to eliminate contributions of inferior quality from being included in the high-quality core publications, it does not necessarily eliminate them from the information cycle. After rejection, the author will most probably approach lower-quality core journals or even the peripheral periodicals, and, if accepted, the inferior contribution is included in the information cycle, usually through the abstract and index journals and SDI services, which all too often seem to strive for comprehensive coverage rather than quality of content. Ideally thus, contributions of inferior quality should be excluded.

This barrier is identified as the 'barrier of inferior information quality'.

2.1.7 Political-ideological restrictions

Engelbert (1971b:402; 1974a:51) names the barrier that can arise because of the restricted access to or exchange of information between ideologically opposed systems as "die politisch-ideologische Barriere" (political-ideological barrier) and "die politisch-ideologische Informationsbarriere" (political-ideological information barrier) respectively.

As a name for this barrier, the translated version of the first term used by Engelbert is preferred, and the barrier is thus called the 'political-ideological barrier', a term also used in a previous study of the author (Haag, 1978:18).

2.1.8 Ownership

Although it is considered desirable that information for research purposes be accessible to all who need it, the owner of certain information must sometimes impose a barrier to ensure the monopolistic retention of that information within his system to the exclusion of other systems, e.g. through copyright, patent rights or restrictions placed on access to confidential information. While access to information subject to copyright or patent laws can be acquired through licensing, access to confidential information is attainable only through clandestine methods.

A barrier, related to the political-ideological barrier, arises when the information needs of the outside researcher are not satisfied due to ownership restrictions. Engelbert (1971b:402; 1974a:51) identifies this barrier as "die Eigentumsbarriere", i.e. ownership barrier.

As name, the translated version of the term used by Engelbert is adopted, but to differentiate this barrier from the next barrier, its scope is limited to the restrictions placed on access to confidential information to the exclusion of access to information covered by copyright or patent laws.

2.1.9 Judicial and legal stipulations

Related to the political-ideological barrier and the ownership barrier is the barrier experienced as a result of laws or regulations imposed to counter the distribution of information, for example for political-ideological or for ownership reasons. Engelbert (1971b:402; 1974a:52) calls this "die Gesetzbarriere", i.e. law barrier.

This barrier is called the 'judicial barrier', and to differentiate it from the two previous barriers, limits its definition to copyright and patent laws.

2.1.10 Terminology

The degree of success achieved in communication within the same language depends upon a mutual recognition and understanding of the terminology used in the publication and by the reader (Pearson, 1973:418). This communication is not barrier-free as within disciplines new terms are constantly generated which contribute to looseness, duplication and instability of terminology (Basu, 1972:32). This not only creates problems for indexers (Garfield, 1964:58; Harris, 1974:105; 1979:77), but decreases understanding (Duncan, 1972:283), and confronts other researchers from the same discipline with difficulties in recognizing relevant terminology. Furthermore, the differentiation of science is also accompanied by greater specialization of terms used in each of its fields, and specialists in different fields understand each other less and less, the solving of interdisciplinary and multidisciplinary problems becomming more difficult. Mikhailov et al. (1984:25-28) call this barrier the "intralanguage barrier", while Engelbert (1971b:402; 1974b:47) refers to it as "die Terminologiebarriere" (terminology barrier). In a later article, Engelbert (1976:2) separates this barrier into the "interlingual" (foreign language) and the "innerlingual" (technical terminology) barriers.

As a name for this barrier, the translated version of Engelbert's "Terminologiebarriere" is accepted, and the barrier is thus called the 'terminology barrier', the term also adopted in earlier studies by Haag (1978:19; 1984:216).

2.1.11 Horizon barrier

Because of the narrow subject specialization or the concomitant narrowness of level of qualification, researchers cannot always assimilate relevant information because they cannot recognize or identify it and do not consider it as relevant. Polushkin & Zhdanova (1970:1) call this the "intra-language barrier". Tagliacozzo (1976:95), emphasizing the different terminology used in the different levels of competence or technicality, refers to the "level of technicality" that may create barriers to understanding, while Engelbert 1971b:402) calls this barrier "die Horizontbarriere", i.e. horizon barrier.

As a name, the translated version of the name given by Engelbert is adopted, and the barrier is named the 'horizon barrier'.

2.1.12 Semiological barrier

Mikhailov et al., (1984:29), in addition to identifying the foreign language barrier (described in 2.1.13), and the terminology barrier, identify the "semiological barrier". They state that "as the level of abstraction increases in science, more complex explanations and more specialized terminology inevitable come into use. As a result, the number of scientists who completely understand scientific theories tends to decrease proportionately ... the increasingly abstract character of science gives rise to ... the loss of concrete knowledge ...".

The name 'semiological barrier' is retained as name for this barrier.

2.1.13 Foreign language barrier

To name the problem that arises when relevant information cannot be identified or used because it is written in an unfamiliar language, the term 'foreign language barrier' is frequently used, for example by Hanson (1962), Wood (1967), Hunter (1970), Saunders (1972), Rowley & Turner (1978:298-317), Haag (1984:217-218) and Large (1983). The similar term 'foreign language problem' is also frequently used (Hanson, 1962; Wood, 1967; Saunders, 1972; Dickson, 1979; and Ellen, 1979). The term 'language barrier' is used by Hutchins, Pargeter & Saunders (1971a), Anderson (1978), Frank & Behrmann (1978), Ellen (1979), Gordon & Santman (1981), Risseeuw (1981) and by Van Bergeijk (1981), while Bunge (1974:76) uses the term 'barrier of language'. Other terms used in the literature to name this barrier are 'language boundaries' (Ganeshsundaram, 1980) and 'interlanguage barrier' (Polushkin & Zhdanova, 1970:1; Mikhailov et al., 1984:15-25), 'linguistic barrier' (Bailey, 1976; Michel, 1982), while in the German literature Frank (1971) and Loeben & Runge (1985) use the term 'Sprachbarriere' (language barrier) and Engelbert (1974b:47-48) the term 'Fremdsprachenbarriere' (foreign language barrier).

To emphasize the 'foreign' element of this barrier and to exclude the semantic, linguistic or cultural differences between the different languages, the term 'foreign language barrier' is selected for this report.

2.1.14 Dispersal of information

The growth of a science is naturally accompanied by an increase in and diversification of the number of contributions to its literature. Simultaneously, these contributions are increasingly dispersed among more publications of the same type, e.g. periodical titles, among a larger variety of type, form and media, among more countries and more languages. Fur-

thermore, cross-disciplinary and multi-disciplinary tendencies dictate that contributions are increasingly published under a variety of related sciences. Gray & Perry (1975:22) describe this as the "scattered nature of the growth in literature". This growth dictates that the researcher should consult and go beyond the traditional sources of published information and should include all relevant contributions irrespective of media, language and subject. The barrier takes effect if the researcher has to invest or fails to invest extra effort to spread his search as wide as the dispersal of a science with a high scatter rate demands, and if the coverage attained is inadequate.

In the literature this barrier is referred to as the "dispersal of information barrier" (Haag, 1978:22), the name retained for this report.

2.1.15 Information congestion

'Too much' information is referred to in the literature as 'information explosion' (Bryan, 1968:389; Ashworth, 1974:63; Horton, 1974:1-3; Cliffe, 1980:106), 'information overload' (Rudd & Rudd, 1986a,b), as 'information input overload' (Meier, 1965:268), as 'communications overload' (Meier, 1962/1963:521), 'reading overload' (Bernier, 1978:445), 'congestion of available information barrier' (Haag, 1978:20), while Engelbert (1974b:49) calls it "die Aufnahmefähigkeitsbarriere" (receptivity barrier) or the "Lesebarriere" (reading barrier).

The continuing expansion in the volume of relevant published information demands a parallel increase in the information search and handling capacity of the researcher. Since this capacity is limited and static , the required search capacity may exceed the researcher's ability to search, assimilate and process the literature available on the particular research topic (Garvey, 1979:106; Engelbert, 1971a:6).

Such an amount of relevant information makes effective access to published information more difficult and time consuming, causes a decline in information search effectiveness and a growing inaccessibility of information (Seidman, 1981:65). Although users are capable of distinguishing between relevant and irrelevant information and appear to cope (Grether & Wilde, 1983:115), too much relevant information can cause a barrier to effective information utilization.

The name 'receptivity barrier' as coined by Engelbert does not adequately indicate the nature of the barrier. In the absence of a better name, the barrier is called the 'barrier of information congestion'.

2.1.16 Irrelevant information

Ideally, the researcher would prefer to receive only significant information and no 'noise', i.e. irrelevant and insignificant information. Invariably part of the information provided however (besides possibly being inaccurate, repetitive, obsolescent, or of poor information excellence) is also irrelevant (not related to the need), while another part is insignificant (related to the need but not important).

The researcher can experience a barrier if retrieved information is passed on to him without or without sufficient screening and he, instead of the LIS, has to separate the wheat from the chaff. If the amount of irrelevant and insignificant information exceeds the amount of relevant and significant information, the exercise might not be worth the effort, the source consulted is likely to be avoided.

Basu (1972:32) calls this "noise polution", while Engelbert (1974b:50) calls the barrier "die Übertragungsbarrieren oder Übertragungsfehler" (transmitting barriers or errors). These terms are not sufficiently specific, and the barrier is called the 'barrier of irrelevant information".

2.1.17 Limited time

Although obtaining effective and efficient access to published information is an important and integral part of the research process, this function cannot always get the attention it deserves because of increasing time restrictions (Beinhauer & Schmacke, 1970:8; Steinbuch, 1970:73). Chen (1974:278) even identifies a lack of time as a major factor for not using the library, while the respondents in the survey by Summers et al. (1983:84) ranked finding sufficient time to look for or read information as the most serious of their identified problems.

Haag (1978:19), in a previous study, called this the "time barrier", but the term 'barrier of limited time' is more descriptive and suitable.

2.1.18 Geographic distance

Information channels which are considered more readily accessible will be used more frequently than less accessible channels (Allen & Gerstberger, 1967:10-11). Similarly, the distance that has to be covered before the researcher can make contact with the required information source can, if excessive, present a barrier. This applies not only to the researcher who has to cover a long distance before reaching the LIS of his organization, but also to the researcher working in a remote area without adequate LIS as well as the South African researcher geographically isolated from overseas information sources.

This barrier is called the 'barrier of geographic distance' (see also Haag, 1978:18; 1984:218).

2.1.19 Precluded access to information

To indicate the barrier that can arise when existing information, because of various reasons, cannot be obtained, Polushkin & Zhdanova (1970:1) use the term "communications barrier". As contributory reasons they list: lack of direct or indirect communication between specialists, institutions, countries, etc. to explicit or implicit desire not to widely disseminate the documented information.

Engelbert (1971b:402) and Langhein (1985:239) describe this barrier, which is caused by a host of reasons, (e.g. required publication is missing or out on loan, opening hours, lack of access to online systems, user fees, the 'political-ideological barrier' or the 'ownership barrier') as "die Zugangsbarriere" (the access barrier). This translated term, i.e. 'access barrier' is used as name for the barrier.

2.1.20 Excessive effort input

Whereas with the 'access barrier' the required information was not obtained, with this barrier it is obtainable but only after so much effort that its acquisition is not justified.

Engelbert (1974b:50), in describing this barrier, retains his term "Zugangsbarriere" (access barrier) used for describing the previous barrier

in an earlier article, but moves the emphasis from unobtainability to the effort involved in obtaining that information.

Two separate barriers are however involved. Only the latter barrier relating to the excessive effort required to obtain information is involved, and this barrier is called the 'excessive effort barrier'.

2.1.21 Decreasing accessibility of information with age

In his 1971 survey of barriers, Engelbert (1971b:401) sees a relation between the age of information and accessibility to it. He states that information is, on average, accessible in direct relation to its age during the first ten years after publication, thereafter in reverse relation, i.e. that accessibility improved up to ten years after publication and then declines. Without stating the nature of the barrier, he calls this increase and subsequent decrease in accessibility "die Zeitbarriere" (time barrier).

In his 1974 survey of barriers, Engelbert (1974a:52), adds two other elements to his initial description:

- Intensity of use usually declines with age, i.e. the older a publication the less likely it is to be used.
- Because of publication delay, new ideas cannot be published fast enough.

These are two separate, even contradictory elements to the first description provided by Engelbert. Basing the barrier only on the assumption that access to older publications is usually more difficult than access to newer publications, this barrier is called the 'barrier of decreasing accessibility of information with age'.

2.1.22 Difficult to use information media

The researcher can experience barriers in using some of the types of media carrying information. While researchers are reasonably successful in handling monographs, periodicals, and abstract and index journals, they might encounter barriers in obtaining access to other types of media such as reports, codes, standards and specifications, patents, preprints and reprints, trade literature, technical recommendations, conference proceedings, and translations not published commercially. This literature is issued in different media: on paper or microform, as photographs, maps, slides or computer printouts. Such material can represent a large proportion of the researcher's information source, and the successful handling of this material is considered minimal (Davies, 1970).

This barrier is called the 'barrier of difficult to use media'.

2.1.23 Inadequate financial support

Accessibility to information can be adversely affected by a shortage of funds. A barrier is experienced when required publications or information services, because of inadequate funds, cannot be provided, cannot be supplied in the required form or within the required time. Engelbert (1971b;402; 1974a:53) call this barrier "die finanzielle Barriere" (financial barrier).

This barrier is called the 'barrier of inadequate financial support' (see also Haag, 1978:17).

2.1.24 Effectiveness regulators

An information system, according to Engelbert (1974a:53), operates effectively when minimum effort achieves maximum benefit. He calls this regulatory factor "die Effektivitätsbarriere" (effectiveness barrier) and states that it prevents information handling from becoming an end in itself, i.e. without ulterior benefit for the user. This barrier is successful when only that information of which the cost and effort involved are smaller than the expected benefits, is allowed to enter the information system. The barrier, as requirement for assuring the optimum effectiveness of information handling, demands the testing of documents to be included in the information system for their worthiness (Dokumentierwürdigkeit) and that e.g. publications of low scientific value are not accessioned or are eliminated as soon as publications of higher scientific value are received. Engelbert concludes his contribution on this barrier with the statement that the barrier is insufficiently developed in an information system that evaluates its service in terms of number of documents held rather than in terms of user satisfaction.

There are two difficulties with Engelbert's "Effektivitätsbarriere". Firstly, it is not a barrier but a management approach, guideline or principle and should be differently named, e.g. the 'ineffectiveness barrier'. Secondly, the barrier is very general as it covers many, if not all, LIS activities and lacks the specific barrier connotation strived for by this report and as manifested in the other identified barriers. It was only included in the project because in 1.1.2.1 it was decided that all barriers named as such would be included. Nevertheless Engelbert's translated version (effectiveness barrier) is retained as name for this barrier.

2.1.25 Poor strategy for information searching

Obtaining effective and efficient access to published information for research is not a simple procedure, as is evident from the flow charts in the literature (Swenson, 1965:240-241; Hafke, 1969:48-52; Ladendorf, 1970:215-222; Heidtmann, 1971:59-71; Redmond, Sinclair & Brown, 1972:449-450; Carss, 1975:298; Rothwell, 1975:219-222; Wilkin, 1977:262-266; and Appleyard, 1979:66). Information handling in the research process is an ongoing and complex interaction between researcher and information sources which demands a well-developed information searching strategy. This is a skill that is not readily acquired; it matures through training and experience and demands the following attributes in the researcher and the personnel of the LIS attending to the information needs of the researcher:

- a realization of the value and importance of information
- knowledge of the subject being researched and its terminology
- sufficient and sustained interest and time to trace required information
- adequate search capacity
- familiarity with published information sources and their use
- familiarity with the bookstock and facilities of at least the local relevant LIS.

As these attributes are not always fully developed in all researchers and personnel assisting the researchers, the optimum retrieval benefits from the information system are not always attained.

This barrier, previously called the "barrier of weak information searching strategy" (Haag, 1978:29; 1984:217), is now called the 'poor strategy for information searching barrier'.

2.1.26 Ignorance of information sources and services

Besides the presence of a weak information searching strategy, the researcher, due to the increase in the number of publications and the dispersal of information and services, can become estranged from his relevant sources of information and services, and according to Schoeman & Reyneke (1972:10), are not sufficiently familiar with available information sources.

Haag (1978:22-24) calls this the "barrier of ignorance for basic sources of information and services". As this name is too long, this barrier is called the 'ignorance of information sources barrier'.

2.1.27 Unawareness barrier

Polushkin & Zhdanova (1970:1) use the terms "unawareness barrier" and "ignorance barrier" to describe the user's unawareness of already created and existing information. They prefer the first term and the name 'unawareness barrier' is retained for this barrier. If the unawareness is caused by a weak information searching strategy, it forms part of that barrier, as does the following barrier.

2.1.28 Suspected existence of information barrier

Conscious wants can be constrained by the perception of what is feasible. An information barrier, according to Engelbert (1971b:402), can arise out of the human habit to search only for that information which is assumed to exist. This barrier prevents, through ignorance of the researcher, the development of the need to search for information irrespective of whether it is thought to exist or not. Thus an information source such as the LIS is usually only approached or consulted for information that is considered to exist. Conversely researchers tend to ignore information they believe does not exist. Engelbert initially calls this barrier "die Unkenntnisbarriere" (ignorance or unawareness barrier) but in a later article (1974b:49) renames this barrier "die Bewusstheitsbarriere" (consciousness or awareness barrier). He elaborates that the becoming aware of the need for information to solve a problem and of the existence of information and its availability depends on many factors, e.g. on personal motivation, information handling background, working habits, knowledge and awareness of available information facilities and services, and the extent of previous successful or unsuccessful experiences in acquiring information.

This barrier is called the 'suspected existence of information barrier' (see also Haag 1979:18; 1984:217).

2.1.29 Lack of commitment

While the 'suspected existence of information barrier' precludes the researcher from following up information which he suspects does not exist, a lack of commitment precludes the researcher from requesting available information or from using supplied information. The barrier arises out of the fact that the benefits of information are not automatic but that a concerted effort has to be made to become informed.

Engelbert (1974b:49) calls this "die Resonanzbarriere" (resonance barrier), but the name 'lack of commitment barrier' is selected.

2.1.30 Undefined images

Bunge (1974:76) named the barrier that arises when the user of the LIS does not fully understand the role of the librarian who also does not fully understand the needs of the patron the "barrierof images".

To promote clarity of meaning, the name of the barrier is changed to the 'barrier of undefined images'.

2.1.31 Unnecessary duplication of research

Unnecessary duplication or replication of research implies that a research project or part of a research project duplicates or overlaps with previously conducted and published research.

While unintentional duplication of research cannot be justified, intentional duplication of research is, for the following three reasons, sometimes necessary:

- It might be both cheaper and quicker to duplicate small research projects than to search the literature for possible contributions (Sisco, 1957).
- Some duplication of research is required to verify new research results.
- Whereas unintentional duplication of research in the sciences indicates ignorance of developments in the science concerned, and incomplete literature searching, the duplication of research in the humanities is more justified, as this is concerned with opinion and interpretations which cannot be measured by standardized method and which supplement and complement rather than duplicate previous research.

Many factors and other barriers can contribute towards the unnecessary duplication of research, e.g.

- The nature of research generally demands that secrecy be maintained until a new contribution has been thoroughly tested and verified. In such instances, parallel research is virtually unavoidable.
- Ignorance of ongoing research activity and of the findings of research. Lynam, Slater & Walker (1982:10-11, 54) report that in librarianship only four per cent of the sample felt really well informed about current research in their own field.
- Weak information searching strategy before and during the research project failed to retrieve relevant data.
- The delay in publishing, also of index and abstract journals.
- Research results were published in a foreign language or in an obscure publication.
- Inadequate indexing in abstract and index journals.

Unintentionally duplicated research is a waste of research funds, time, effort and potential. However, the researcher is constantly uncertain whether or not his research is duplicating ongoing or completed research. The barrier of duplication of research, therefore, is a serious barrier, and Fishenden (1965:163) is justified in including in his description of an efficient information system the assurance that earlier research is not unnecessarily duplicated.

In an earlier study Haag (1978:25-27) calls this barrier the "barrier of duplication and replication", but as this description is not specific enough, the name is changed to 'barrier of unnecessary duplication of research'.

2.2 ADDITIONAL BARRIERS IDENTIFIED BY RESEARCHERS

As described in 1.1.2.2, sixteen researchers in five institutions would help to identify barriers by diary method.

These researchers submitted 50 different comments of which nine, listed in Appendix 5 on page 188, relate to barriers already identified from the the literature. The following thirteen barriers, additional to those already identified from the literature, could be identified from the remaining 41 comments.

2.2.1 High cost of publications

Two comments can be classed into this barrier:
- High cost of publications.
- Publications should not be subjected to import duty.

This barrier arises when, because of increasing cost of publications, with no comparable increase in budgets, the required publications cannot be purchased. The literature outlines the extent of price increases (Varna, 1983:62; Raphaely, 1988).

This barrier is called the 'barrier of high cost of publications'.

2.2.2 Information scarcity

In contrast to too much information (barrier of information congestion), the researcher, especially the researcher active in areas of narrow specialization or on the forefront of research, might encounter a barrier when pertinent information does not exist. This is due to the scarcity of such information and not because of faulty or weak retrieval strategy.

The identifying comment submitted was 'lack of required information, e.g. meaningful reports on the application in the field'. As a working definition, this barrier is called the 'barrier of information scarcity".

2.2.3 Information not published

The qualifying comment was: 'Gaining access to unpublished data is cumbersome and difficult.'

This barrier concerns access to existing information that, because it has not been published, is not included in the formal announcement, distribution and record system and thus remains relatively unaccessible. Information that has been produced but is not published defeats the purpose of knowledge production.

There are several reasons for not publishing research results: Pressure of work; rejection of the contribution after submission for publication; lack of a suitable publication outlet; an underestimation of the applicability of the findings; publishing delay; page charges, and the impression that the research grapevine or conference presentation constitutes an adequate distribution channel. Menzel (1959:215) adds the following possible reasons: The information is felt difficult to verbalize economically; standards of publication make communicating information of certain kinds unduly lengthy and laborious; authors or editors believe that few researchers would utilize the information; the information is felt to be 'trivial', regardless of its utility.

This barrier is called the 'barrier of unpublished information'.

2.2.4 Gaps in the collection

Two similar comments fall into this category:
- Certain essential publications are not held in the RSA.
- The LIS does not hold a complete set of internal reports published by the organization because of selection oversight.

Without striving for self-sufficiency, it is important and practical for LIS management that at least 'most' of the researcher's immediate and frequent needs for publications can be met from the LIS of his own organization (Kania, 1988:22). Obvious gaps in the collection could involve a delay in the receipt of information from another LIS and could thus cause a barrier.

The barrier that is caused when essential publications are not acquired is called the 'barrier of gaps in the collection'.

2.2.5 Poor selection of new publications

Related to the previous barrier, the identifying comment was: 'many publications acquired that are not used or only seldomly used'.

Unused publications on the shelves of the LIS are a waste of financial and maintenance resources.

This barrier is called the 'barrier of poor bookstock selection'.

2.2.6 Complex arrangement and layout of the collection

Four comments form the 'barrier of complex arrangement and layout of the collection':
- The periodical collection is not arranged in one continuous sequence, but is dispersed in various locations throughout the LIS.
- Publications are moved frequently to new locations without notice or shelf guides.
- The arrangement of books on shelves is not user-friendly.
- Publications are not in their correct place on the shelves.

A lack of guides to publications and misshelving can cause a barrier because required publications are difficult to find or cannot be found.

2.2.7 Missing publications

The 'barrier of missing publications' pertains to publications which were acquired by the LIS, but which cannot be traced. Many reasons can cause a publication to go missing, e.g. misshelving, misfiling of records, theft or incorrect record keeping of acquisitions, withdrawals or loans.

2.2.8 Incomplete or unreliable reference tools

The following six comments make up this barrier:
- HSRC directory of research projects lacking or deficient.
- Bibliographic tools for identifying the location of publications held by other LIS not reliable.
- Databases contain spelling errors.
- Medlars lacks important key-words.
- Books lack indexes.

- Indexes in books are either incomplete or poorly compiled.

This barrier is called the 'barrier of unreliable reference tools'.

2.2.9 Processing delays

This category of comments relates to the excessive delays experienced by users in the processing of publications by the LIS. Six such delays were identified and relate to

- placing orders for new publications
- executing orders for new publications
- cataloguing new publications
- binding of periodicals
- supplying requested information
- local and international interlending requests.

This barrier is identified as the 'barrier of processing delays'.

2.2.10 Inconsistent processing

The researchers submitted the following four comments to this barrier category:

- Filing inconsistencies of journals of societies - some are filed under *Society of ... Journal*, others under *Journal of the... Society*.
- No apparent consistency in binding supplements to journals - some supplements are bound with the mother journal, others separate from the mother journal.
- Reminders are repeatedly sent for loans already returned.
- The circulation of contents pages was stopped without consultation, notice or explanation.

This barrier is called the 'barrier of inconsistent processing'.

2.2.11 Centralized information system

This barrier is compiled from the following two comments:

- Centralization and rationalization of the bookstock and information service has created a perfect system which nobody will want to use.
- A core library is required in the department for supporting teaching and research.

This barrier is identified as additional to the 'barrier of geographic distance' (described in 2.1.18) because its implications are far wider.

The name of this barrier is the 'barrier of centralized information system'.

2.2.12 Unhelpful LIS procedures , rules and regulations

The following eleven comments fall into this barrier category:

- Unbound periodicals may not be taken out on loan.
- Interlending requests for recently published publications are not accepted.
- Interlending requests for publications without an indication of holdings are not accepted, i.e. the researcher is expected to establish from the union catalogues which LIS hold the required publication.
- A maximum of three interlending requests may be submitted at a time.
- Loan period of publications received on interlending are not always long enough.

- There is a need to have access to other research libraries without much red tape, e.g. through the use of a nationally accepted entrance card.
- It should be possible to take out publications directly from another research library and to return such items via the own library.
- Loan renewal procedures are unacceptable as loans have to be personally and physically returned for renewal. This presents a problem because the loan period is short, no permanent or annual loans are allowed; it is necessary to take out many publications; the library where the renewal is done is not within walking distance and offers no parking facilities.
- Because of a shortage of funds, a request for a new periodical subscription must be accompanied by a cancellation of an existing subscription.
- Overdue publications are not recalled.
- No enquiries permitted to establish whether a publication out on loan may be quickly consulted. Thus the potential borrower has to await the loan expiry date, even though the present borrower could most probably accommodate a brief consultation before expiry date.

These comments are all grouped into the 'barrier of unhelpful LIS procedures, rules and regulations'.

2.2.13 Unsuitable personnel

With regard to subject librarians, the following three problem areas were recorded: Personnel
- are not aware of developments in the subject(s) they are attending;
- do not take an interest in the department they serve, and
- do not know how to use reference tools.

This barrier is called the 'barrier of unsuitable personnel'.

2.3 ADDITIONAL BARRIERS IDENTIFIED BY MANAGERS OF LIS

As motivated in 1.1.2.3, barriers were also to be identified by thirteen managers in ten organizations. These managers submitted 143 barrier-related comments, listed in Appendix 6 on page 189. Of the comments that could be tested with the target group, the following four additional barriers, made up of ten similar comments, could be identified:

2.3.1 Late and inaccurate book reviews

The following four comments can be accommodated in this barrier category:
- Book reviews are published late.
- Book reviews do not cover all the new publications.
- Book reviews can contain misleading information and are usually not specific enough.
- New publications should be announced in a standardized way and procedure.

Thus a barrier may arise if, for example, unsuitable publications are acquired on the strength of weak or misleading reviews.

This barrier is identified as the 'barrier of late and inaccurate book reviews'.

2.3.2 Obsolete and surplus publications in the LIS

The identifying comment for this barrier was that the LIS shelves contain obsolete information and unused bookstock.

Unless withdrawn through weeding, obsolescent (going out of use or date) and of obsolete (superseded, out-of-date, disused, antiquated) information on the shelves of the LIS can lead to a barrier if:

- it becomes difficult to search for and to identify relevant information because the system is cluttered with irrelevant, obsolete or surplus information;
- obsolete information is taken for valid current information and is used for research purposes.

This barrier is called the 'barrier of obsolete and surplus publications in the LIS'.

2.3.3 Incomplete or incorrect bibliographic references

The three identifying comments for this barrier were:

- Bibliographic descriptions in references are lacking, incomplete and inaccurate.
- References are not standardized.
- References in book reviews are either missing, incomplete or inaccurate.

The literature, and experience, confirms that references are not given when required (Key & Roland, 1977:136), particularly by authors of developing countries (Gordon, 1979:341-342). A barrier may arise when time is wasted or contributions to the literature cannot be traced because of incomplete, incorrect or unstandardized references in articles or in abstract and index journals.

This barrier is called the 'barrier of incomplete or incorrect bibliographic references'.

2.3.4 Inadequate subject-indexing level

Two comments pertaining to the subject catalogue make up this barrier:

- The level of subject-indexing is too shallow.
- There is confusion about the level of subject-indexing required.

While indexes might be useful for searching for references on a particular topic, they are not successful in tracing references on aspects of a topic, e.g. information barriers, or tracing ideas or theories of a topic not easily named in distinctive terms (Weinberg, 1988:4). Thus a barrier may arise when the level of subject-indexing does not meet the required depth.

This barrier is called the 'barrier of inadequate subject-indexing level'.

2.4 ADDITIONAL BARRIERS IDENTIFIED BY CORRESPONDENCE

As determined and described in 1.1.2.4, thirteen prominent overseas organizations active in research in librarianship and information science would be approached for additional information on barriers.

The replies received indicated that no additional barriers to those already identified from the three preceding sources could be identified. The replies received also confirmed that no overview of barriers experienced by users of LIS is being compiled and that no study is concerned with the measurement of barriers.

2.5 ADDITIONAL BARRIERS IDENTIFIED FROM PERSONAL EXPERIENCE

As indicated in 1.1.2.5, if any additional barriers not identified by the preceding four sources can be identified from personal experience, these should also be listed.

The coverage of the preceding sources, however, proved so complete that only aspects of barriers already listed, and only the following three additional barriers could be identified:

2.5.1 Information published in obscure publications

Relevant information is sometimes unexpectedly retrieved from publications not usually used for publishing the contributions of a particular discipline. The barrier arises not because the initial search was not wide enough within the discipline concerned, but because the contribution eluded the abstract and index journals of the discipline concerned by entering the information cycle through the obscure publication.

Due to the lack of a suitable outlet for their contributions, the interdisciplinary studies are particularly exposed, e.g. research methods, while due to the absence of an 'own' local professional journal, some researchers in established disciplines are forced to publish in 'related' local journals.

The name given to this barrier is the 'barrier of information published in obscure publications'.

2.5.2 Incomplete coverage by abstract and index journals

Because of the barrier of information receptivity and the dispersal of information barrier, the researcher has to place increasingly more reliance on abstract and index journals for identifying relevant literature (Martyn & Slater, 1964:212) and to eliminate non-essential documents (Kennedy, 1978:568).

Personal experience has shown that the coverage by abstract and index journals of new contributions to the literature is not in all instances complete. Firstly, the contributions to South African periodicals seem particularly prone, for it appears that not only are some major local periodicals not covered by international secondary publications, but that the coverage of the contents of the journals that are covered can be selective and delayed. Thus these international secondary publications cannot always be used as a reliable searching tool for local contributions.

This barrier is identified as the 'barrier of incomplete coverage by abstract and index journals'.

2.5.3 Ineffective organization of own research information and documentation

Observation has shown that in many instances researchers do not know how to handle the information and documentation gathered in the course of a research project. While not identified as a barrier in the literature, it also confirms the need for such efficient information and documentation handling capacity (Engelbart, 1961:122; Meyer-Uhlenried, 1967:235-236; Stibic, 1980:1-3; Burton, 1981; Dow, 1987:30-31). This barrier arises not so much from a lack of interest, but due to a lack of know-how and most likely also due to a lack of assistance from the LIS.

This barrier is called the 'barrier of ineffective organization of own research information and documentation'.

2.6 ADDITIONAL BARRIERS IDENTIFIED DURING THE PILOT STUDY OF THE QUESTIONNAIRE

As indicated in the method developed for the compilation of the questionnaire (1.2.4.3), the pilot study would also be used to identify any additional important barriers for possible inclusion in the final version of the questionnaire (questions 6.2 and 21 of the questionnaire, Appendix 4).

The 13 researchers however identified no additional important barriers, but only 24 barrier-related aspects of six already identified barriers, presented in Appendix 7 on page 194.

This indicates, that as far as researchers are concerned, the identified barriers provide an adequate operational basis for proceeding to the next step of the project.

2.7 SUMMARY OF CHAPTER 2

This chapter briefly described the 51 identified barriers.Thirty one barriers were identified from the literature, thirteen additional barriers by researchers, four additional barriers by managers, and three additional barriers from personal experience. On considering the types of barriers that were identified by the various sources, it is obvious that the different sources identified divergent categories of barriers. While the literature identified barriers in all three component of the information cycle, the managers of LIS, as can be expected, primarily identified systems and operational barriers, but also barriers researchers should have, but failed to identify. Although it is usually the head of the LIS, and not the user who makes recommendations for improved services (White, 1979:81), it is particularly perturbing that some of the serious barriers known to exist and known to exist in the organizations concerned, were not identified by the sixteen researchers involved in the collection of details of barriers by diary method. They instead not only identified relatively few, but also only minor barriers.

Instead of ending this chapter with a list of the barriers by source which identified them, an alternative arrangement - by origin of the barrier in the information cycle - was selected, i.e. by publisher (as publisher of information), by library and information system (as processor), and by researcher (as user and generator of information), as illustrated in Figure 2, page 8. Such an arrangement reveals the distribution of the barriers in the information cycle, and this will be useful for later anlysis.

<u>Barriers primarily inherent in the publishing of information</u> (21 barriers)
Barrier of publishing delay
Barrier of publication standards not applied
Barrier of repetitive information
Barrier of inaccurate information
Barrier of obsolescent information
Barrier of inferior information quality
Political-ideological barrier
Ownership barrier
Judicial barrier
Terminology barrier
Semiological barrier
Dispersal of information barrier

Barrier of information congestion
Barrier of irrelevant information
Excessive effort barrier
Barrier of difficult to use media
Barrier of high cost of publications
Barrier of information scarcity
Barrier of unreliable reference tools
Barrier of late and inaccurate book reviews
Barrier of incomplete coverage by abstract and index journals.

Barriers primarily inherent in the processor of information (18 barriers)
Foreign language barrier
Barrier of geographic distance
Barrier of decreasing accessibility of information with age
Barrier of inadequate financial support
Access barrier
Effectiveness barrier
Barrier of unnecessary duplication of research
Barrier of gaps in the collection
Barrier of poor bookstock selection
Barrier of complex arrangement and layout of the collection
Barrier of missing publications
Barrier of processing delays
Barrier of inconsistent processing
Barrier of inadequate subject-indexing level
Barrier of centralized information system
Barrier of unhelpful LIS procedures, rules and regulations
Barrier of unsuitable personnel
Barrier of obsolete and surplus publications in the LIS.

Barriers primarily inherent in the user of published information (12 barriers)
Horizon barrier
Barrier of limited time
Poor strategy for information searching barrier
Ignorance of information sources barrier
Unawareness barrier
Suspected existence of information barrier
Lack of commitment barrier
Barrier of undefined images
Barrier of unpublished information
Barrier of incomplete or incorrect bibliographic references
Barrier of information published in obscure publications
Barrier of ineffective organization of own research information and documentation.

This is an arbitrary categorization, for some barriers can be accommodated under another section, while others can be accommodated in more than one category. Although the list contains several similar barriers that can be combined (thus reducing the number), the preponderance of the barriers inherent in the publishing of information is obvious.

The 51 identified barriers exceed the number of barriers expected, and it is apparent that the questionnaire cannot accommodate all the identified barriers, nor can it measure them all with the devised lengthy formula $s = f + e1 + e2 + t$. A selection of barriers to be included in the questionnaire will therefore have to be made.

CHAPTER 3: SELECTION OF IDENTIFIED BARRIERS FOR INCLUSION IN THE QUESTIONNAIRE

Purpose and scope of Chapter 3

Because the 51 identified barriers cannot be all measured within the 45-60 minutes allocated for the questionnaire interview, the inclusion of barriers in the questionnaire must be selective. This chapter establishes criteria for inclusion so that the selection of the barriers to be included and to be excluded can be made. It selects the method by which the included barrier will be measured (as devised in 1.2.3.3 and 1.2.3.4), and motivates the exclusion of barriers not selected.

3.1 SELECTION CRITERIA

The following four criteria were found applicable:

- **Coverage and barrier seriousness:** In 1.1.1 two of the criteria applied for identifying barriers were wide coverage and seriousness. In selecting barriers for further analysis, these criteria are again applied. Thus as many barriers as can be accommodated, and then primarily those which exert a more serious effect should be selected for inclusion and for further analysis. The selection process however is not as straightforward as it seems, and involves a good deal of arbitrary judgement and personal experience.
- **Occurrence rate,** i.e. the number of times a barrier is likely to occur. Preference for inclusion should be given to the frequently rather than to the infrequently occurring barriers.
- **Distribution,** i.e. universal occurence or isolated occurrence in specific organizations, preference being given to include universally occurring rather than regional barriers.
- **Testability:** Some barriers might be either difficult or cumbersome to test and would require disproportionate attention in relation to other barriers. Such barriers, provided they are not extensive or serious barriers, should rather not be included for further analysis.

In addition to these criteria, inclusion can proceed along three methods:

- Acceptance of the barrier as described in 2.1 to 2.5;
- Selective representation of multi-facet barriers. Some barriers are composed of many facets and testing them would require a disproportionate amount of time. By ignoring the not so important facets and by measuring some of the more important facets, such barriers are nevertheless partly accommodated and represented.
- Rationalization of similar barriers: due to the different interpretations given to some of the barriers by authors and researchers, barriers either overlap, are related or form part of another barrier. For clarity reasons and in order to avoid unnecessary duplication, the overlapping barriers should be combined and sub-barriers considered for inclusion in the more comprehensive barriers. As example can be cited the barrier of inferior information quality, which accommodates the barrier of repetitive information, the barrier of inaccurate information, and the barrier of obsolescent information.

The approach to the selection process is to identify and eliminate those barriers that do not comply to the established criteria, and then to list the remaining barriers to be included in the questionnaire.

3.2 BARRIERS EXCLUDED FROM THE QUESTIONNAIRE

Applying the selection criteria, 21 barriers were excluded. These are listed in Table 1, the respective codes for the reason(s) for exclusion being;

Code 1 = not serious enough
2 = occurrence (frequency) too low to provide representative data
3 = distribution rate too low amongst researchers
4 = too difficult, cumbersome or time-consuming to test adequately within the questionnaire, mainly because too many issues are involved
5 = response might not be reliable or representative, mainly because of a cumulation of other factors covered by the other codes, e.g. researchers not all qualified to indicate the extent of a barrier
6 = not really a barrier but a management regulatory factor
7 = researchers alone not qualified to indicate the extent of the barrier as they are not always directly exposed to the barrier
8 = cannot be tested within this questionnaire; the coverage by the literature is adequate.

Table 1: Barriers excluded from the questionnaire

Name of barrier	Described in Section	Reason(s) for exclusion
Collection development		
Barrier of publication standards not applied	2.1.2	1,4
Barrier of high cost of publications	2.2.1	4,8
Political-ideological barrier	2.1.7	4,5
Ownership barrier	2.1.8	2,4,3,5
Judicial barrier	2.1.9	1,2,3
Barrier of poor bookstock selection	2.25	4,5
Information processing		
Terminology barrier	2.1.10	1,2,3
Horizon barrier	2.1.11	1,2,3,4
Semiological barrier	2.1.12	1,2,3
Reference and information retrieval		
Barrier of limited time	2.1.17	4,5
Document delivery		
Barrier of decreasing accessibility of information with age	2.1.21	1,2,3,4,6,7
Excessive effort barrier	2.1.20	4,5
Barrier of difficult to use media	2.1.22	2,3,4,8
Supporting services and management		
Barrier of inadequate financial support	2.1.23	4,6,7,8
Access barrier	2.1.19	4,5
Effectiveness barrier	2.1.24	6,7
Barrier of undefined images	2.1.30	4,5,6,7
Barrier of inconsistent processing	2.2.9	1,4
Barrier of centralized information system	2.2.10	4,8
Barrier of ineffective organization of own research information and documentation	2.5.3	1,4
Barrier of unhelpful LIS procedures, rules and regulations	2.2.12	1,4

Admittedly, the criteria for exclusion are very wide and not very specific, and the exclusion process is subjected to arbitrary judgement and personal interpretation, but also based on personal experince gained in serving re-

searchers. While some barriers were easy to select, the exclusion of others was more difficult. Some readers might, for example, not agree with the exclusion of the barrier of inadequate financial support, but this barrier is not only too cumbersome to determine accurately, but is dependent on so many other factors, e.g. the discipline concerned, the historical background of the bookstock in the LIS, acquisitions policy, LIS management expertise, a national information policy, an adequately stocked national library, and co-operative acquisition programmes. The issue of inadequate funding is also an emotional issue with users of LIS, and although excellence of a LIS is not determined by the size of its bookstock (Willemse, 1984:5), it is all too often seen as the only reason for an inadequate bookstock (which is covered in the questionnaire by the barrier of gaps in the collection), whereas other issues are also involved.

3.3 BARRIERS INCLUDED IN THE QUESTIONNAIRE

Of the original 51 identified barriers, the 30 remaining barriers listed in Table 2 meet most of the selection criteria for inclusion (seriousness, frequency, distribution, and testability) as outlined in 3.1.

The layout a) and the arrangement b) of Table 2 is as follows:

a) Layout

Short name of barrier: the short version of the name

Described in Section: refers to the section where the barrier is described

Method of inclusion: indicates how included with codes

code 1 = straightforward inclusion as described in 2.1 to 2.5
2 = selective representation of multi-faceted barrier
3 = rationalization of similar barriers and sub-barriers.

Method of measuring: indicates how measured in the questionnaire interview.

code 1 = full testing by method designed in 1.2.3.3, i.e. testing for presence, effect on the acquisition of information process, effect on the project and for trend;
2 = testing for presence and if positive, whether it presents a barrier or not (described in 1.2.3.4);
3 = testing for presence and when last experienced;
4 = testing for presence and extent;
5 = testing for presence only.

Selective aspect(s) covered: refers to the aspect(s) by selective coverage of multi-faceted barriers.

Number(s) in the questionnaire: indicates the number of the question(s) in the questionnaire by which the barrier is measured.

b) Arrangement

Instead of dealing with individual barriers in random sequence, the selected barriers are presented by the broad basic and supporting function as outlined in the description of "Library and information system" in the Introduction.

Table 2: Barriers included in the questionnaire

Name of barrier	Method of inclusion	Method of measuring	Number(s) in the questionnaire
Barrier of publishing delay	1	2	10.9
Barrier of information scarcity	1	1	10.2
Barrier of unpublished information	1	2	10.3
Barrier of incomplete coverage by abstract and index journals	1	2	10.4
Barrier of late and inaccurate book reviews	1	2,4	10.11;10.13
Barrier of incomplete or incorrect bibliographic references	1	2	10.8
Barrier of repetitive information	1	1	9
Barrier of inaccurate information	3	1	9
Barrier of obsolescent information	3	1	9
Barrier of inferior information quality	1	1	9
Barrier of gaps in the collection	1	5	7.3
	1	1	7.4.1
	2	4	7.4.4;7.4.5
Barrier of complex arrangement and layout of the collection	2	2	17.1
Barrier of missing publications	1	2	17.2
Barrier of obsolete and surplus publications in the LIS	1	1	8
Foreign language barrier	1	1,3,4	12
Barrier of inadequate indexing level	1	1,4	11
Barrier of information congestion	1	1	10.1
Barrier of irrelevant information	1	5	10.14
	1	1	14.3
Barrier of unreliable reference tools	2	2	10.5;10.7
Barrier of information published in obscure publications	1	2	10.10
Barrier of geographic distance	2	2	13.2;13.3
Dispersal of information barrier	3	2	13.2;13.3
Barrier of processing delays	1	1,4	15.1;15.4; 17.3;17.4
Poor strategy for information searching barrier	1	3	2.1;5.2;
Ignorance of information sources barrier	3	3	6.1;7.3;
Unawareness barrier	3	3	12(dnk);
Suspected existence of information barrier	3	3	13.1;4.3-7,
Lack of commitment barrier	3	3	18;20
Barrier of unnecessary duplication of research	1	5	18;19
Barrier of unsuitable personnel	2	4	7.2
	2	5	14.1
	2	4	14.2
	2	5	14.6

Several of the barriers were presented together, primarily because they are related and their seriousness can be collectively determined. Thus the four barriers of repetitive information, inaccurate/out of date information, and information from inferior research are covered collectively. Similarly, the poor strategy for information searching barrier covers the

ignorance of information sources barrier, the unawareness barrier, the suspected existence of information barrier and the lack of commitment barrier.

3.4 SUMMARY OF CHAPTER 3

In Chapter 3 thirty of the more important barriers were selected for inclusion in the questionnaire interview. After combining the similar barriers, 22 barriers remain for measuring. The method of measuring the seriousness of these barriers was indicated. Of the 22 barriers, the seriousness of eight will be determined by the formula $s = f + e1 + e2 + t$ and the seriousness of the remaining 14 barriers by one of the alternative methods.

CHAPTER 4: SELECTIVE CHARACTERISTICS OF THE TARGET GROUP

Purpose and scope of Chapter 4

Whereas the previous three chapters prepared the compilation of the questionnaire interview, the subsequent chapters will primarily attend to the data collected during the interviews. The purpose and scope of Chapter 4 is to describe the following selective characteristics of the target group (in addition to those mentioned in 1.2.5).

- distribution by discipline and organization
- distribution by number of years of research experience
- percentage of working day spent on research
- distribution by category of research activity
- availability of subject specialist services
- use made of sources for published information
- frequency of contact with the LIS of the own organization.

4.1 DISTRIBUTION BY DISCIPLINE AND ORGANIZATION

As indicated in 1.2.5, the target group was compiled by purposive sampling and comprises 60 researchers, 15 each from the discipline education, medicine, physics and sociology, thus 30 respondents from the natural and 30 from the human sciences. The organizations selected were the Atomic Energy Commission, (AEC), Human Sciences Research Council (HSRC), Rand Afrikaans University (RAU), the South African Institute for Medical Research (SAIMR), University of Pretoria (UP), and the University of the Witwatersrand (UWITS). The distribution of the target group by organization and discipline is outlined in Table 3.

Table 3: Distribution of target group by discipline and organization

Discipline	ORGANIZATION						
	Research			Academic			
	HSRC	AEC	SAIMR	UP	UWITS	RAU	TOTAL
Education	6	0	0	3	3	3	15
Medicine	0	0	6	3	3	3	15
Phisics	0	6	0	3	3	3	15
Sociology	6	0	0	3	3	3	15
Subtotal	12	6	6	12	12	12	60
TOTAL	24 (40 %)			36 (60 %)			60

As mentioned in 1.2.5, the target group, compiled by purposive sampling, is not representative of all organizations, and the findings cannot therefore be generalized to apply to other organizations. This will be discussed later in the project under 6.2.6.

4.2 DISTRIBUTION BY NUMBER OF YEARS OF RESEARCH EXPERIENCE

The distribution of research experience is required for determining whether or not there is a meaningful correlation between the amount of research experience and the extent of barriers. This requirement determines that the distribution of research experience be categorized, preferably by forming equally or fairly equally large response groups. Three groups which are considered sufficiently representative of the categories 'less experienced', 'more experienced', and 'most experienced', are compiled. As can

be seen from Table 4, the 'average' number of years of research experience is just over twelve years, and the distribution of the respondents is nearly equally distributed amongst the three categories of research experience.

Table 4: Distribution of target group by categories of research experience

Categories of research experience	DISTRIBUTION OF TARGET GROUP	
	Number	Percentage
Less experienced (4-7 years)	19	32,0
More experienced (8-13 years)	20	33,0
Most experienced (14-30 years)	21	35,0
TOTAL	60	100

4.3 DISTRIBUTION BY PERCENTAGE OF WORKING DAY SPENT ON RESEARCH

The distribution of researchers by percentage of working day spent on research is tabulated in five categories:

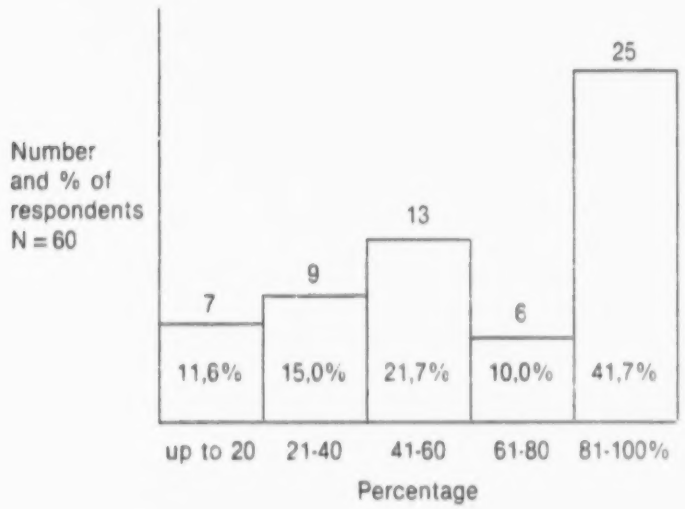

Figure 6: Distribution of target group by percentage of working day spent on research

Thus about 27 % of the target group spends up to 40 % of their working time on research, about 22 % spend 41-60 %, and about 52 % spend more that 60 % of their working time on research. It might be revealing to establish whether the researchers spending more time on research experience other barriers than the researchers spending less time on research, but such an analysis is not part of this report.

4.4 DISTRIBUTION BY CATEGORY OF RESEARCH ACTIVITY

Of the study sample, only one respondent was primarily active in conducting team research under guidance, 34 respondents (56,7 %) conducted their own

project without guidance while four respondents (6,7 %) conducted team research without guidance and 21 respondents (35,0 %) managed researchers and research projects. These figures only serve to show the composition of the target group; no further analysis on the extent of the seriousness of barriers by category is intended.

4.5 AVAILABILITY OF SUBJECT INFORMATION SPECIALIST SERVICES

Strictly speaking a subject information specialist is somebody with quallifications in a subject as well as in librarianship, but for the purpose of this project it indicates a professional librarian (irrespective of subject quallifications) attending to the information needs of researchers in a particular subject.

Of the six institutions covered, the LIS of one research organization (SAIMR) and one academic institution (UWITS) did not provide its researchers with subject specialist services, though the latter did maintains divisional libraries for medicine and physics. The researchers in education and sociology, as did those at the SAIMR, made use of the main reference counter of their LIS. Of the 60 respondents, 42 researchers (70,0 %) had access and 18 researchers (30,0 %) had no access to subject specialist services. One respondent in the former category was not aware that the LIS of his organization provided such a service. This analysis is academic and no comparison whether researchers with subject specialist services experience more, the same, or fewer barriers than do researchers without such services is intended.

4.6 USE MADE OF SOURCES FOR PUBLISHED INFORMATION

As the study of the published literature is an essential and integral part of the research process, the types of sources used as well as the absence or low use of published information sources could explain the presence of certain barriers, e.g. the barrier of unnecessary duplication of research. Furthermore, it would be interesting to correlate use of information sources with the extent of barriers experienced, particularly as barriers experienced could lead to a low use or avoidance of the sources.

To identify any absence or low use of information sources, the respondents were requested to indicate their use of or contact with colleagues, bookshops and publishers, library subject catalogue, journals, abstract or index journals, databases and subject specialist services as a source of published information. They were also requested to indicate when last they had used these services. The responses are summarized in Table 5 on the next page.

Several comments can be made to the statistics in Table 5.

- The high reliance of researchers on their colleagues for information is known and accepted by the LIS as an essential information channel.
- The frequence and the intensity of the consultation of bookshops is certainly a new factor to the author; might this indicate a lack of adequate LIS facilities or does the researcher see bookshops as a complementary and supplementary service?
- The figure of 51,7 % for the target group who never consult the subject catalogue, and the low intensity and frequency of those who do, may indicate that the subject catalogue is of limited use to researchers.

Table 5: Provision and use of specific information sources

Sources	Not available	USE OF SOURCES AND WHEN LAST USED: last week	last month	last 3 months	last 6 months	last year or longer	never
Colleagues	0,0	48,3	35,0	8,3	1,7	5,0	1,7
Bookshops	0,0	31,7	23,3	10,0	5,0	0,0	30,0
Subject catalogues	0,0	11,6	18,3	6,7	3,3	8,4	51,7
Journals/display	0,0	35,0	13,3	3,3	5,0	1,7	41,7
Journals/circulated	5,0	47,4	21,1	0,0	1,7	1,7	28,1
Abstracts/indexes	0,0	20,0	21,7	8,3	6,7	15,0	28,3
Database: direct	88,3	0,0	14,3	0,0	14,3	0,0	71,4
Database: LIS	5,0	15,8	17,5	1,8	7,0	12,3	45,6
Subject specialist	30,0	33,3	19,0	2,4	2,4	4,8	38,1

- As journal subscriptions demand a large proportion of the LIS budget, the high non-use of journals on display is contrary to the spirit of research. Might this high incidence rate indicate that the display is too far away, or that it simply is too much trouble to consult the display? The latter might be a factor, for selecting titles from amongst other journals on other subjects, not knowing when a new issue has arrived, consulting the same issue twice, or not being aware of issues missed, are some of the real factors that may deter use.
- The relatively high percentage of the target group to whom journals are circulated but who do not consult them (28,1 %) may indicate that researchers do not have the time to consult the circulating new issues or that the circulating journals are not relevant. Experience has taught that both of these reasons are valid.
- The 28,3 % of the target group who never consult abstract and index journals, and the 15,0 % who last consulted them last year or longer ago, might indicate an under-utilization. It must however be taken into consideration that researchers on the forefront of research derive their information through informal information channels rather than through published information channels. They only consult abstract and index journals as a check to make sure that they have not missed any relevant information, or when embarking on an unfamiliar research topic.
- Considering that the LIS of all the participating organizations have their own or have access to database services, the high percentage of non-users (45,6 %) indicates that researchers either are not aware that the LIS is executing database searches on their behalf (which is doubtful), or that they are simply not ulilizing them.
- While 30,0 % of the target group are without subject specialist service, 38,1 % of those researchers who have such services never use them. Such under-utilization is certainly cause for concern.

4.7 FREQUENCY OF CONTACT WITH THE LIS OF THE OWN ORGANIZATION FOR RESEARCH PURPOSES

In order to establish the extent of this contact, responses were gathered on the frequency the own LIS

- supplied unsolicited references to publications or information;
- is personally visited for research purposes (as opposed to returning publications);
- is contacted by telephone, post or messenger for research purposes.

The responses are tabulated in Table 6

Table 6: Frequency of contact with the LIS of the own organization for research purposes

Manner of contact	FREQUENCY OF CONTACT WITH LIS Once a week	Once a month	Once in 3 months	Less often	Never
Unsolicited references	16,7	10,0	8,3	1,7	63,3
Personal visit	73,3	15,0	6,7	3,3	1,7
Contact by telephone, post or messenger	13,3	10,0	5,0	3,3	68,3

(Row totals = 100)

The analysis of the three types of contact for research purposes by organization is reflected in Table 7. (a = supply of unsolicited references by the LIS; b = personal visit to the LIS; c = contact by telephone, post or messenger).

Table 7: Frequency of contact with the LIS of the own organization, by organization

Name of organization		FREQUENCY OF CONTACT WITH LIS Once a week	Once a month	Once in 3 months	Less often	Never
AEC	a	-	33,3	16,7	0,0	50,0
	b	33,3	33,3	16,7	16,7	0,0
	c	33,3	0,0	0,0	16,7	50,0
HSRC	a	75,0	8,3	0,0	8,3	8,3
	b	91,7	8,3	0,0	0,0	0,0
	c	16,7	25,0	8,3	0,0	50,0
RAU	a	0,0	16,7	25,0	0,0	58,3
	b	83,3	0,0	16,7	0,0	0,0
	c	25,0	8,3	8,3	8,3	50,0
SAIMR	a	0,0	0,0	0,0	0,0	100,0
	b	83,3	16,7	0,0	0,0	0,0
	c	0,0	0,0	0,0	0,0	100,0
UP	a	8,3	8,3	0,0	0,0-	83,3
	b	50,0	25,0	8,3	8,3	8,3
	c	8,3	8,3	0,0	0,0	83,3
UWITS	a	0,0	0,0	8,3	0,0	91,7
	b	83,3	16,7	0,0	0,0	0,0
	c	0,0	8,3	8,3	0,0	83,3

(Row totals = 100)

Table 6 confirms observations that researchers prefer personal visits to the LIS for research information, and that most LIS personnel are more reactive than preactive in supplying information (first line of Table 6). The widely diverging responses in the first column of Table 7 are interesting, but no further analysis is intended as the project does not make comparisons amongst the LIS services of the participating organizations.

4.8 SELECTORS OF NEW BOOKS AND JOURNALS (Q 7.1)

The respondents were requested to indicate who was mainly responsible for preselecting, recommending and final approval of new books and journals. Admittedly this is a difficult question to ask, for usually both the LIS and the user will claim that they are mainly responsible for selection. The LIS can justify its claim through the initial distribution of announcements and suggestions for purchase to the user, and the selection of reference tools. The user justifies his claim primariiy through the selection and approval process. In absence of the LIS of the organizations involved not being able to indicate their point of view on who selects new books and journals, the responses of the target group in Table 8 can be expected to reflect this bias in favour of the researcher as selector.

Table 8: Selectors of new books and journals

Selectors	BOOKS Prese-lection	Recom-mending	Final approval	JOURNALS Prese-lection	Recom-mending	Final appro-val
Do not know	0,0	0,0	1,7	3,3	3,3	8,3
Departmental head or respondent	98,3	100,0	88,3	95,0	96,7	68,3
Subject specialist	0,0	0,0	0,0	0,0	0,0	0,0
Other LIS staff	0,0	0,0	0,0	0,0	0,0	0,0
Library committee	0,0	0,0	8,3	0,0	0,0	21,7
Other	1,7	0,0	1,7	1,7	0,0	1,7

(Column totals = 100)

4.9 BARRIERS IDENTIFIED AS CAUSING A DECREASE IN THE USE OF THE LIS (Q 6.2)

Before the respondents were requested to respond to questions on specific barriers in the main part of the questionnaire, they were asked whether there were any barriers that caused a decrease in their use of the LIS. The purpose of this question was threefold: Firstly to introduce to the respondent the section in the questionnaire dealing with specific barriers, secondly to test the respondents awareness of barriers before asking him to respond to specific barriers, and thirdly, to see which type of bariers are, and which are not identified, e.g whether the more serious barriers are identified.

Of the sixty respondents, 31 mentioned that one or more barrier caused a decrease in their use of the LIS. The following 9 barriers were mentioned, the number in brackets indicating the number of respondents:

Barrier of unhelpful LIS procedures, rules and regulations (15)
Barrier of gaps in the collection (5)
Barrier of geographic distance (5)
Barrier of complex arrangement and layout of the collection (4)
Dispersal of information barrier (3)
Barrier of limited time (2)
Barrier of unsuitable personnel (2)
Barrier of missing publications (1)
Barrier of inadequate indexing level (1)

The following comments, which cannot be accommodated by any of the identified barriers, were also made:

- insufficient seating (5)
- atmosphere in the library too austere; airconditioning ineffective (2)
- too few photocopy machines, prone to breakdowns (2)
- identification card required by the LIS before access is granted (1).

4.10 SUMMARY OF CHAPTER 4

Chapter 4 described the characteristics of the target group pertaining to distribution by organization, their research activity, the availability and use made of information sources.

Several comments and deductions can be made from the data contained in this chapter:

- The main impression obtained from Table 5 is the extent of underutilization of LIS facilities and services. This may be due to the ignorance of the available facilities and services, a poor information searching strategy on the part of the researchers, or may indicate that the LIS services offered are not as relevant or as useful to the researcher as they could or should be. In other words the LIS, as a system with the purpose to promote access to published information, might contain and or cause system barriers which discourage use. Chapter 5 will deal with the seriousness of the barriers associated with some of the LIS facilities and services.
- Table 6, in 4.7, shows the low preactive role librarians play in supplying unsolicited relevant references, and the high extent to which researchers rely on getting their required information themselves. This indicates the predominantly passive role of the LIS and leads to the deduction that researchers do not involve the LIS in their research and that the LIS is not active in promoting the research effort of the researcher.
- The emphasis researchers place on system barriers in 4.9, and the lack of identifying other barriers, is contrary to the summary at the end of Chapter 2, which shows the extent to which barriers are also inherent in the publication as well as in the researcher himself. The barriers listed in 4.9 indicate either that only a few researchers experience these few barriers, or that the researchers are not aware of other barriers. Their responses to the questions on specific barriers in the main part of the questionnaire will provide the answer.

CHAPTER 5: ANALYSIS OF COLLECTED DATA

Purpose, scope and arrangement of Chapter 5

The purpose of this chapter is to present the data on the extent and the seriousness of barriers as identified in the literature study and as identified by the target group, and to present a list of barriers arranged in order of seriousness.

The following method is adopted for presenting the collected data:

- The terms *target group* and *incidence group* are frequently used in this chapter. The first term describes the group of 60 respondents covered by the questionnaire, whereas the second term describes those respondents within the target group who experience a certain phenomenon (but not a barrier), e.g. publishing delay. Those respondents of the incidence group who experience the phenomenon as a barrier are called the *barrier group.*
- In the tables the extent and the seriousness of the barriers is presented either as percentage of the incidence group or as percentage of the target group. Wherever necessary and where there is sufficient space in the tables, both percentages are provided, e.g. Table 12 on page 69.
- It is important for the project to create a list of barriers arranged in order of barrier seriousness. As the size of the incidence group differs from barrier to barrier, such a comparison cannot be based on the incidence group. To be able to compare the seriousness of the various barriers, the size of the barrier group is expressed in terms of the target group, i.e. 60.
- As determined in 1.2.3.3, weighting is to be applied for calculating the average weighted index for each response category. For the barriers to be measured by formula **s = f + e1 + e2 + t** this is done by multiplying the symbols used in 1.2.3.2 (1 to 5 for effect of the barrier on the acquisition of information, 1 to 5 for the effect of the barrier on the effect of the barrier on the project), multiplying each of these symbols by the percentage of the target group responding to that symbol. For Table 12 page 69, for example, the calculation for determining the average weighted index for the effects of information scarcity on the acquisition of information process would be:

Column: 1	2	3	4
no effect (1):	1 ×	0 =	0
delays acquisition (2):	2 ×	1,7 =	3,4
increases effort (3):	3 ×	40,0 =	120,0
increases cost (4):	4 ×	3,3 =	13,2
eliminates accessibility/usability (5):	5 ×	18,3 =	91,5

Explanation of column meanings:
Column 1 = response categories and values
2 = response values from Figure 4 and 5, pages 19 and 20
3 = % of target group of 60 experiencing the barrier
4 = multiplication of columns 2 and 3.

Column 4 totals 228,1. Divided by five gives the average weighted index of 45,6 for the effect of the barrier on the acquisition of information. The same calculation is repeated for determining the average weighted index of the barrier on the effect of the project. Weighting is also used for the trend, where the number of respondents indicating a decreasing trend are weighted with 1, those with a constant trend by 2, and those with an increasing trend with 3, and dividing the product by 3. Applying the formula **s = f + e1 + e2 + t**, the product represents the

seriousness of the barrier, e.g. for the barrier of information scarcity, page 71, seriousness = 63,3 + 45,6 + 43,6 + 39,9 = 192,4. To place this figure into perspective the following calculation can be made: Assuming that all 60 respondents in the target group come across information scarcity, and assuming that to all of the target group this represents a barrier, i.e. 100,0 % or 100 for the calculation, and furthermore assuming that the effects of the barrier on the acquisition of information and also on the research project are recorded as maximum effects (5 on Figure 4 and 5 of page 19 and 20), and furthermore assuming that the target group all indicates an increasing trend for the barrier, the calculation for s = f + e1 + e2 + t would be as follows:
frequency: 100
effect on the acquisition of information: 100 x 5 divided by 5 = 100
effect on the research product: 100 x 5 divided by 5 = 100
trend: 100 x 3 = 300 divided by 3 = 100.
This gives a product of 400 and represents the maximum seriousness. Repeating the same calculation if half the target group experience the barrier and all the barrier group indicating effects of 3 for e1, and 3 for e2, with a constant trend, would give: 50 + (50 x 3 divided by 5) + (50 x 3 divided by 5) + (50 x 2 divided by 3) = 50 + 30 + 30 + 33,3 = 143,3. The seriousness of a barrier experienced by half the target group, with the minimum possible effect, i.e. no effect, for a decreasing barrier would be recorded as 50 + 10 + 10 + 16,6 = 86,6. The seriousness of the Category B barriers is simply expressed in terms of percentage frequency the barrier is experienced, the range being zero to 100.

- As the target group is smaller than 100, the intervals for each response are, at 1,6 % relatively large and it is not always possible to tally 100 exactly. Generally the data is presented to the nearest tenth percent.
- To facilitate the writing of this report and to facilitate references from this chapter to the section in the questionnaire under discussion, the applicable headings in the text are followed (in brackets) by the question number in the questionnaire, e.g. **(Q 10.9)** as in the heading of 5.1.2.
- The number of respondents is not indicated in the tables if this is 60. If the number differs, the heading of the table will indicate the number of respondents, e.g. in Table 11, which is based on 37 respondents (N=37).
- Wherever possible the tables provide both the number of responses and the corresponding percentage. In tables where not enough line length is available to accommodate both, the responses are presented only as percentage. The number of respondents are, wherever possible, also included in the summary overview of the extent of each barrier.
- Some of the findings might contain sensitive information. In such instances the organizations are not identified.
- The data is presented and expressed quantitatively rather than qualitatively, with only some provisional comment, e.g. a comparison of the seriousness of the barrier as identified in the literature and as identified by the target group. The data, mainly presented in table form (from Table 9 to 53), cannot be analysed or interpreted separately until an overview of all the data is obtained. The synthesis of the collected data, with interpretation, comment or discussion, follows in Chapter 6.
- Because of a shortage of space in the headings of tables the abbreviation *dnk* is frequently used to represent 'do not know'.

The data for the 21 barriers are presented separately for each barrier, using the following methods and the following order:

- A brief introduction recalls how the barrier was initially identified, briefly describes the barrier, and indicates where in Chapter 2 the barrier is more fully described.
- The extent of the phenomena as identified in the literature, e.g. for the barrier of publishing delay this would comprise the extent of publishing delay, i.e. the rejection lag and publication lag.
- The extent and the seriousness of the barrier as identified in the literature. Wherever available, examples in the literature pertaining to the four selected disciplines (education, medicine, physics, and sociology) are selected. If examples for these disciplines are not available, examples of the extent of the barrier in other disciplines are quoted.
- The extent of the barrier as identified by the target group. This constitutes the main part of the investigation and includes a description of which aspects of the barrier are measured and which measuring method, as outlined in 1.2.3.2 to 1.2.3.4, is selected.
- Summary of the barrier as identified in the literature and by the target group. If comparable, the extent of the the barrier as indicated by the target group is compared to the extent of the barrier as identified from the literature.
- Calculation of the seriousness of the barrier by using either the formula **s = f + e1 + e2 + t** or one of the alternative methods. The figure obtained is not discussed but serves only to place the barriers in priority order of seriousness at the end of this chapter. As indicated at the beginning of this chapter, the maximum possible predicted seriousness attainable is a figure of **400**, and if half the target group would experience 'increased effort' and 'increased cost' with a constant trend, the figure would be 143. The figures calculated at the end of every section can be placed into this rough context.

The barriers measured by formula **s = f + e1 + e2 + t** are included in Category A, those measured by the alternative methods are included in Category B. The barriers are attended to in the following section and sequence, their respective category indicated by in brackets (A) or (B):

5.1 Barrier of publishing delay (B)
5.2 Barrier of information scarcity (A)
5.3 Barrier of unpublished information (B)
5.4 Barrier of late and inaccurate book reviews (B)
5.5 Barrier of incorrect or incomplete bibliographic references (B)
5.6 Barrier of inferior information quality (A)
5.7 Barrier of gaps in the collection (A)
5.8 Barrier of complex arrangement and layout of the collection (B)
5.9 Barrier of missing publications (B)
5.10 Barrier of obsolete and surplus publications in the LIS (A)
5.11 Foreign language barrier (A)
5.12 Barrier of inadequate subject-indexing level (A)
5.13 Barrier of geographic distance (B)
5.14 Barrier of information congestion (A)
5.15 Barrier of irrelevant information (B)
5.16 Barrier of unreliable reference tools (B)
5.17 Barrier of incomplete coverage by abstract and index journals (B)
5.18 Barrier of information published in obscure publications (B)
5.19 Barrier of processing delays (B)
5.20 Poor strategy for information searching barrier (B)
5.21 Barrier of unnecessary duplication of research (B)
5.22 Barrier of unsuitable personnel (B).

5.1 BARRIER OF PUBLISHING DELAY

Introduction

The barrier of publishing delay with its two contributory causes (rejection lag and publication lag) was briefly described in 2.1.1. The data now leading to the discussion on the barrier of publishing delay are compiled from two sources: the extent of the barrier of publishing delay as identified in the literature, and as identified by the target group.

5.1.1 The barrier of publishing delay as identified in the literature

The extent of the barrier is detemined by establishing the extent of the rejection lag and the publication lag and the extent of the barrier caused by these lags.

5.1.1.1 The extent of publishing delay

The literature offers several detailed analysis of the rejection lag and the publication lag for journal articles and conference proceedings, as well as indications of the publishing lag for abstract and index journals. As these lags only indicate the respective periods involved but not the extent of the barrier caused by the delay and are, therefore, not pertinent to the discussion here, their extent is presented as an overview in Appendix 8 on page 196 and summarized as follows:

Rejection lag
Journal articles:
. Physical sciences 3 months; Human sciences 7 months.
Conference papers:
. Physical sciences 4 months; Human sciences 8 months.
Publication lag
Journal articles:
. Physical sciences 7 months; Human sciences 10 months.
Conference papers:
. Physical sciences 7 months; Human sciences 10 months.
Abstract and index journals:
. Physical sciences 5,5 months; Human sciences 9 months.

This implies a cumulative publishing delay (rejection lag plus publication lag) for journal articles of ten months in the physical sciences and 17 months for the human sciences; a delay for conference papers of eleven months in the physical sciences as against 18 months for the human sciences; a delay for abstract and index journals of 5,5 months for the physical sciences, and nine months for the human sciences.

5.1.1.2 The extent of the barrier of publishing delay

The search of the literature on the extent of the barrier for journal articles, conference papers, and for abstract and index journals, revealed only some relevant contribution on the extent of the barrier for journal articles. For example, the Royal Society study (Study on the scientific ..., 1981:2) established that speed of publication ranked first priority for authors in chosing the journal in which they wanted to publish. Several authors have made general comments that the delay in publishing journal articles presents a problem or that it takes 'too long' to get scientific papers published (Yokote & Utterback, 1974:251; Roland & Kirpatrick, 1975:1275; Carson & Wyatt, 1983:155; Lambert, 1985:40). A few other authors have tried to determine the extent of the problem:

- Törnudd (1959:62-63), in her analysis of Scandinavian research, mentions that "slowness of publication" was identified by 15 of the 42 respondents (36,1 %) as a difficulty experienced with their own publication, while 9 of the 148 respondents (6,1 %) indicated that it presented a difficulty in acquiring information and keeping up with advances.
- Eight percent of the respondents of the American study of physiologists mentioned slowness of publication as a difficulty (Törnudd, 1959:62).
- In the study of Burger (1987:20-21) on the extent of satisfaction with current South African publishing, 89 of 242 respondents in the human sciences, i.e. 36,8 %, 101 of 193 respondents in the social sciences, i.e 52,3 %, 72 of 195 respondents in the pure sciences, i.e. 36,9 %, and 95 of 186 respondents in the technological sciences, i.e. 51,1 %, were dissatisfied with the delay in publishing articles in journals.

Although the literature indicates that the lags in publishing journal articles seems to be a potential problem, there is no indication of the extent of unnecessary and avoidable delays nor of the seriousness of the effects of the delays. The extent of the barrier of publishing delay cannot thus be adequately determined from the literature.

5.1.2 The seriousness of the barrier of publishing delay as identified by the target group (Q 10.9)

The barrier of publishing delay present a relatively peripheral and minor issue to LIS management, falling beyond his field of activity and thus limiting his involvement and concern. For these reasons, and also because of the restricted coverage imposed on the questionnaire interview by the limited amount of allocated time, the questionnaire attends to only the delays in some of the more important types of research publications i.e. journal articles, conference proceedings, and abstract and index journals. Furthermore, the method of measuring the barrier is limited to determine only whether the respondent experienced a publication delay, and if so, whether it presented a barrier or not. Delays in journal articles were experienced by 43 researchers, in conference papers by 41 researchers and in abstract and index journals by 14 researchers. The percentage responses are summarized in Table 9. The extent of the barrier experienced is calculated on the number of researchers experiencing the barrier (second last column) expressed in percentage (last column) in terms of the target group of 60.

Table 9: Extent of the barrier of publishing delay by type of publication

	EXTENT OF DELAY AND BARRIER EXPERIENCED					
	Delay experienced			Barrier experienced		
Type of publication	Dnk %	Yes %	No %	No %	Yes No.	Yes %
Journal articles	3,3	71,7	25,0	10,0	37	61,7
Conference papers	8,3	68,4	23,3	6,7	37	61,7
Abstract & index journals	35,0	23,3	41,7	0,0	14	23,3

(Row totals = 100)

From this table it is evident that the barrier of publishing delay is present in all the three types of publications inspected, but is mainly experienced with journal articles and conference papers. Considering the importance of journals for research, the barrier rate of 61.7 % for journals indicates a potential barrier. The barrier rate for conference papers

is not quite as serious, for unlike journal articles, papers presented are usually the first public presentation of new research information. Conferences are used as testing ground for findings, and the feedback obtained may be incorporated before the contribution enters the formal information channel through either a conference proceeding or journal. The 35,0 % 'do not know' response to the delay of abstract & index journals may indicate either non-use or ignorance of arrival in the LIS. The former reason seems more likely, considering the high non-use and under-utilization of abstract & index journals was shown in Table 5, page 57.

5.1.2.1 The barrier of publishing delay by discipline

The summary of the lags as reported in the literature (5.1.1.1) shows significant differences between the extent of the lags for the physical and the human sciences, the latter being considerably longer. The findings of Burger (1987:20-21), as reported in 5.1.1.2, also reveal possibly significant different satisfaction rates among the various sciences. A difference in barrier rate could also, as reflected in Table 10, be recorded in the responses of the target group.

Table 10: Percentage of respondents experiencing the barrier of publishing delay by discipline and by type of publication

Type of publication	DISCIPLINE AND EXTENT OF BARRIER Education %	Sociology %	Physics %	Medicine %
Journal articles	25,0	25,0	16,7	33,3
Conference papers	33,3	30,6	16,7	19,4
Abstract & index journals	21,4	35,8	21,4	21,4

(Row totals = 100)

From this analysis it appears that the respondents in physics have the least barrier with publishing delay, and that the human sciences have the most serious barrier of the disciplines covered. This is in line with the summary in 5.1.1.1. Whether or not this difference is significant falls beyond the scope of this report.

5.1.2.2 The barrier of publishing delay by type of organization

The responses from academic and from research organizations, as shown in Table 11, indicate that more researchers in academic organizations experience the barrier of publishing delay than do the researchers in research organizations.

Table 11: Extent of the barrier of publishing delay by type of organization (academic or research)

Type of publication	N	EXTENT OF THE DELAY Academic %	Research %
Journal articles	37	59,5	40,5
Conference papers/proceedings	37	64,9	35,1
Abstract & index journals	14	71,5	28,5

(Row totals = 100)

No explanation can be offered for this difference, except that publishing lags are shorter in the natural sciences than in the human sciences (as shown in 5.1.1.1), and because the natural sciences are predominantly represented in the 'research' category.

5.1.3 Summary of the barrier of publishing delay

The following summary reflects the extent of dissatisfaction with publishing delay and the extent of the barrier as reported in the literature and as identified by the target group:

The literature

As mentioned in 5.1.1.2, the literature does not provide an overview of contributions from which the extent of the barrier can be summarized. The following summaries of Burger and Törnudd must therefore suffice.

* Respondents dissatisfied with publishing delay of journal articles (Burger):
  - 36,8 % (human sciences)
  - 36,9 % (pure sciences)
  - 51,1 % (technological sciences)
  - 52,3 % (social sciences)
* Respondents who find publishing delay with journal articles a problem (Törnudd):
  - 6,0 % (keeping up with advances in the literature)
  - 8,0 % (slowness of publication of new contributions)
  - 36,1 % (delay in publishing of 'own' publication).

As the study of Burger was concerned with the dissatisfaction with the publishing delay, and the study of Törnudd established whether the delay was a problem, the two findings, though related, cannot be compared.

The target group

* Respondents who experience publishing delay with:
  - Abstract and index journals: 14 respondents, i.e. 23,3 %.
  - Conference papers: 37 respondents, i.e. 68,4 %.
  - Journal articles: 37 respondents, i.e. 71,7 %.
* Respondents who find publishing delay in the following a barrier (taken from Table 9):
  - Abstract and index journals: 14 of 14 respondents, i.e. 100,0 % of the incidence group and 23,3 % of the target group.
  - Conference papers: 37 of 41 respondents, i.e. 90,2 % of the incidence group and 61,7 % of the target group.
  - Journal articles: 37 of 43 respondents, i.e. 86,0 % of the incidence group and 61,7 % of the target group.

A comparison of the extent of the barrier as recorded in the literature and as indicated by the target group is difficult. The percentage of respondents of the Burger study who are dissatisfied with publishing delay cannot be compared to the percentage respondents of the target group who experience publishing delay. The findings of Törnudd (respondents who find publishing delay a problem) can be compared to the extent of the barrier in the target group, the readings being 8 % (slowness of publication) as against 23,3 % of the target group for delays in publishing abstract and index journals, 61,7 % for slowness in publishing conference papers, and 61,7 % for slowness of publishing journal articles. From these rather few statistics it would appear that the barrier of publishing delay is more pronounced in the target group than in the contributions to the literature.

That more than sixty per cent of the target group consider that publishing delay of conference papers and of journal articles is a barrier can serve as an indication of the seriousness of this barrier.

For compiling the list of the barriers in sequence of seriousness at the end of this chapter, the seriousness of this barrier is summarized as follows:

Seriousness of the barrier of publishing delay (Category B)

- Publishing delay for abstract and index journals: 23,3.
- Publishing delay for conference papers: 61,7.
- Publishing delay for journal articles: 61,7.

5.2 BARRIER OF INFORMATION SCARCITY

The barrier of scarce information, pertaining to information that does not yet exist, is mainly experienced by researchers working in areas of narrow specialization or on the forefront of research. This barrier was identified by researchers through the diary method and was briefly described in 2.2.2.

The data leading to the discussion on the barrier of information scarcity is compiled from two sources: the extent of the barrier of scarce information as identified in the literature, and as identified by the target group.

5.2.1 The barrier of information scarcity as identified in the literature

Only two contributions could be traced in the literature. Slater, Osborn & Presanis (1972:11) mention that unpublished or non-existent data was mentioned by 22 % of the data users (separate statistics for unpublished and non-existent data is not provided). As concerns quantitative coverage of information, Slater (1984a:127,130) indicates that 20 of her 448 respondents, i.e. 4,5 %, indicated that there was not enough information (as against 57,5 % of the respondents who said that there was too much information). To 18 respondents, i.e. 90 % of the incidence group and 4 % of the target group, this scarce information presented a problem.

5.2.2 The seriousness of the barrier of information scarcity as identified by the target group (Q 10.2)

Considered from personal experience as a barrier about which little is known, it requires a more thorough measuring. The barrier is thus tested for presence, effect on the acquisition of information, effect on the research project, and for trend. This allows the use of the formula: $s = f + e1 + e2 + t$ to be used for arriving at the weighted aggregative index.

Of the 60 respondents 22 (36,7 %) did not, and 38 (63,3 %) did indicate that they experienced a scarcity of information. Whether this shortage presented a barrier or not could not be tested because it is difficult to test a suspected shortage, but it can be assumed that such a shortage, as is the case with the Slater study, would present a barrier to most, if not all, the 38 respondents.

The opinions of the 38 respondents on the suspected effects of this shortage on a) the acquisition of information process and b) on the research project follow in Tables 12 and 13.

Table 12: Effects of information scarcity on the acquisition of information process

Type of effect	EXTENT OF THE EFFECTS OF INFORMATION SCARCITY ON THE ACQUISITION OF INFORMATION			
	Number N=38	%	Number N=60	%
Scarcity experienced:				
No effect (1)	0	0,0	0	0,0
Delays acquisition (2)	1	2,6	1	1,7
Increases effort (3)	24	63,2	24	40,0
Increases cost (4)	2	5,3	2	3,3
Eliminates accessibility/usability (5)	11	28,9	11	18,3
Subtotal	38	100	38	63,3
No scarcity experienced			22	36,7
TOTAL	38	100	60	100

By multiplying the percentage for N=60 (last column) by the weight as indicated in brackets after the type of effect, and by dividing the total by five (the five different types of effects), the weighted aggregative index for the effect of information scarcity on the acquisition of information comes to 45,6 (as shown at the start of this chapter).

Table 13: Effects of information scarcity on the research project

Type of effect	EXTENT OF THE EFFECTS OF INFORMATION SCARCITY ON THE RESEARCH PROJECT Number N=38	%	Number N=60	%
Scarcity experienced:				
No effect (1)	0	0,0	0	0,0
Increases effort (2)	17	44,7	17	28,3
Increases cost (3)	1	2,6	1	1,7
Delays the project (4)	6	15,8	6	10,0
Decreases the quality (5)	14	36,8	14	23,3
Subtotal	38	100	38	63,7
No scarcity experienced			22	36,7
TOTAL	38	100	60	100

The weighted aggregative index for the effect of information scarcity on the research project comes to 43,6.

From Tables 12 and 13 it is clear that the most frequent effect of information scarcity on both the acquisition of information and on the research project is 'increased effort is required', the second most frequent effect being a 'decreasing research quality of the project'.

As for determining the trend of the barrier of information scarcity, i.e. whether the seriousness of this barrier was decreasing, increasing or remaining constant, seven of the 38 respondents (18,4 %) indicated an increasing trend, 21 respondents (55,3 %) a constant trend and nine respondents (23,7 %) a decreasing trend for the barrier. One of the 38 respondents (2,6 %) could not express an opinion on the trend of the barrier. Expressed as percentage of the target group, the trend was thus considered as increasing by 11,6 %, as constant by 35,0 % and as decreasing by 15,0 % of the traget group.

To arrive at the weighted aggregative index for the trend, the percentage of the target group for each of the three categories is multiplied by a factor of 1 for decreasing, 2 for constant and 3 for increasing, and the total divided by three. This gives an weighted aggregative index of 39,9.

5.2.3 Summary of the barrier of information scarcity

The summary reflects the seriousness of the barrier of information scarcity as recorded in the literature and from the target group:

The literature

* Respondents who experience information scarcity: 4,5 %.
* Respondents to whom information scarcity presents a barrier: 90 % of the incidence group and 4 % of the target group.

The target group

* Frequency barrier experienced: 63,3 %.
* Most frequent effect of information scarcity on the acquisition of information: Increases effort required; 63,2 % of the incidence group, i.e. 40,0 % of the target group.
* Average weighted index for effect of information scarcity on the acquisition of information: 45,6 %.

* Most frequent effect of information scarcity on the research project: Increases effort required; 44,7 % of the incidence group, i.e. 28,3 % of the target group.
* Average weighted index for effect of information scarcity on the research project: 43,6.
* Most frequent trend of information scarcity: Constant; 55,0 % of the incidence group, i.e. 35,0 % of the target group.
* Average weighted index for trend of information scarcity: 39,9.
* Respondents who experience information scarcity: 63,3 %.

A comparison of the extent of the barrier as reported in the literature and as identified from the target group is, because of uncomparable conditions, not possible nor justified. The large difference in the extent of the barrier (only 4 % for the group covered in the literature as against 63,3 % for the target group) cannot be explained. In the absence of further evidence no interpretation of the findings can be provided at this stage.

For compiling the list of the barriers in sequence of seriousness at the end of this chapter, the seriousness of this barrier is summarized as follows:

Seriousness of the barrier of information scarcity (Category A)

Applying the formula $s = f + e1 + e2 + t$, the seriousness of the barrier comes to: $63,3 + 45,6 + 43,6 + 39,9 = 192,4$.

5.3 BARRIER OF UNPUBLISHED INFORMATION

This barrier, caused by important research results that are not published, was identified by researchers and briefly described in 2.2.3. The discussion on the barrier of unpublished information involves an overview of the extent of the barrier as identified in the literature and as identified by the target group.

5.3.1 The barrier of unpublished information as identified in the literature

The extent of the barrier is compiled from the extent of unpublished information and the extent of the barrier as reported by the literature.

5.3.1.1 The extent of unpublished information

The literature, as far as could be ascertained, offers only a sparse indication of the extent of non-publishing and that only of two publication categories, i.e. technical reports and conference papers.

The extent of unpublished technical reports

In their study to determine the extent to which technical reports were published in journals, Gray & Rosenberg (1957:20) established that

- 60 % to 65 % of the unclassified technical reports in general contained publishable data;
- for about half of the technical reports that contain publishable data, all such information is published within two to three years;
- for about a fifth of the reports that contain publishable data, none of the information is published, at least for several years, and much probably never appears in conventional printed form.

The extent of unpublished conference papers

Papers presented at conference symposia are notoriously fugitive as not all the presented papers are published. Liebesny (1959:475) investigating 383

contributions to four conferences of American societies, established that nearly half (48,5 %) of the papers were not published.

One possible reason for the non-publishing of papers is their high rejection rate and the high rate of abandoning publication plans on rejection. Garvey, Lin & Nelson (1970b:79-81), on comparing the communication activities in the physical and social sciences, report that nearly 40,0 % of the authors in the social sciences, nearly 70, % of the authors in the physical sciences and nearly 90,0 % of the authors in the engineering sciences abandoned publication plans during the first year following the meeting after their manuscripts were rejected.

5.3.1.2 The extent of the barrier of unpublished information

The literature does not indicate the extent of the barrier of unpublished information. The only reference to the seriousness of the problem is the statement of Line (1969:216) that "tapping of sources of unpublished information is perhaps the weakest element of all in the services offered by university libraries".

5.3.2 The seriousness of the barrier of unpublished information as identified by the target group (Q 10.3)

To determine the extent of the barrier, the respondents were asked whether they knew of important unconfidential research results that are not published, and if so, whether the failure to publish these presented a barrier or not.

Of the sixty respondents, 23 (38,4 %) did not know of, and 37 (61,7 %) indicated that they know of important unpublished research results. Of these 37 respondents, two indicated that the non-publishing did not present a barrier (3,3 % of the target group), while the remaining 35 respondents (94,6 % of the affirmative cases and 58,3 % of the target group) indicated that it did present a barrier.

5.3.3 Summary of the barrier of unpublished information

As the extent of the barrier of unpublished information does not emerge from the literature, the summary is comprised only from the data collected from the target group:

* Percentage respondents who know of important information not published: 61,6.
* Respondents who consider important information not published a barrier: 94,6 % of the incidence group, i.e. 58,3 % of the target group.

In the absence of any indication of the extent of the barrier of unpublished information in the literature, no comparison can be made to the extent of the barrier as identified by the target group. Besides commenting that the 94,6 % of the incident group experiencing the barrier is very high, and that the frequency of the barrier (58,3 %) provides an adequate basis for comparing its seriousness to that of the other barriers at the end of this chapter, no other comments or interpretations can be offered at this stage.

For compiling the list of the barriers in sequence of seriousness at the end of this chapter, the seriousness of this barrier is summarized as follows:
Seriousness of the barrier of unpublished information (Category B): 58,3.

5.4 BARRIER OF LATE AND INACCURATE BOOK REVIEWS

This barrier, identified by managers of LIS and pertaining mainly to late, incomplete, inaccurate or unreliable, and unstandardized reviews of books and incomplete coverage of book reviews, is briefly described in 2.3.1.

The data leading to the discussion on the extent of the barrier of late and weak book reviews are compiled from the extent of the barrier as identified in the literature, and as identified by the target group.

5.4.1 The barrier of late and inaccurate book reviews as identified in the literature

The extent of the barrier is determined by the extent of late book reviews, the extent of inaccurate descriptions of new publications, and the reliability of reviews of new publications as reported in the literature.

5.4.1.1 The extent of late book reviews

The extent of late book reviews concerns the time lapse between the appearance of the reviewed publication and its review. In her thesis on bibliographic control of South African book reviews, De Witt (1983:55,52,47,86) established time lapses ranging from 7,3 months for agriculture, 7,6 months for zoology and entomology, to 15,3 months for minerology publications, with an average time lapse of about 12,5 months for sixteen South African publishers. Spiller (1986:79), in his *Book Selection*, indicates a delay in the specialist and reviewing journals ranging from six months to a year.

5.4.1.2 The extent of inaccurate book reviews

The literature offers some comments on the disadvantages of book reviews. Merritt, Boaz & Tisdel (1958:vi), for example, state that reviews offer a "chorus of praise, a reluctance to condemn, and a strong tendency to say nothing one way or the other". Commenting on the coverage of reviews in popular journals and newspapers, Spiller (1986:77-78) agrees that the critical content is often minimal and that the percentage of books reviewed is only a fraction of those published. Grogan (1982:118) points out that while most of the scientific and medical books get reviewed at least once, the coverage of technical books, particularly practical and industrial books, is not as good. Serebnick (1984:294-296) confirms the assumption that the key review media are mostly interested in covering the large mainstream publishers.

On the extent of weak book reviews, only one contribution, that of the Royal Society, could be found in the literature. In its study of the scientific information system in the United Kingdom, it established that quality adequacy of reviews was rated "good" by a range from 72,0 % to 89,0 %, as "barely adequate" by a range from 9,0 % to 22,0 %, and as "not good enough" by a range from 0,0 % to 6,0 % of the respondents at the various organizations (Study on the scientific..., 1981:22).

The literature does not indicate whether or not late or weak book reviews present a barrier.

5.4.2 The seriousness of the barrier of late and inaccurate book reviews as identified by the target group

The extent of this barrier was determined by the following questions:

- whether the important new publications on their research subject are reviewed;
- what percentage of the reviews of new publications on the research subject are considered reliable;
- whether or not the respondent experienced a delay in the publishing of book reviews, and if so whether or not this delay presents a barrier;
- whether the respondent came across inaccurate descriptions of new publications by publishers or booksellers and if so, whether this is a barrier.

5.4.2.1 The extent to which new publications on research subjects are reviewed (Q 10.12)

Of the target group, eight respondents (13,3 %) did not know whether the important new publications were reviewed or not. A further 50 respondents (83,3 %) stated that their important new publications were reviewed and the remaining two respondents (3,3 %) that they were not.

5.4.2.2 Reliability of reviews of new publications (Q 10.13)

The respondents were asked what percentage of the reviews of new publications they found reliable. Six respondents (10,0 %) did not consult book reviews and seven respondents (11,7 %) did not know whether book reviews were reliable or not. Of the remaining 47 respondents, five (8,3 %) considered that reviews were 41-60 % reliable, 13 respondents (21,7 %) considered 61-80 % reliable, 28 respondents (46,7 %) considered them 81-99 % reliable and one respondent (1,7 %) considered all reviews on his subject reliable.

5.4.2.3 The extent of the barrier of late book reviews (Q 10.9)

Of the sixty respondents, 30,0 % did not know whether reviews were delayed or not, and 43,4 % experienced no delay with reviews. Of the 16 respondents (26,7 %) that did experience review delays, 11 (68,8 %) considered the delay a barrier and the remaining five (31,2 %) did not. Thus the delay in reviews was considered a barrier by 68,8 % of the incidence group and 18,3 % of the target group.

On analysing the distribution of the barrier by discipline in the incidence group, 63,6 % fell into education, 27,3 % in sociology, and 9,1 % in physics. No researchers in medicine reported a barrier with delayed reviews. The analysis of the incidence group by type of organization showed that 81,2 % of the researchers were attached to academic organizations and the remaining 18,8 % to research organizations.

5.4.2.4 The extent of inaccurate descriptions of new publications by publishers or booksellers (Q 10.11)

Of the target group, 7 respondents (11,7 %) either did not consult descriptions of new publications or replied 'do not know'. Thirty-five respondents (58,3 %) did not come across inaccurate descriptions and 18 respondents (30,0 %) did. To 13 of these 18 respondents, i.e. 72,2 % (21,7 % of the target group), inaccurate descriptions presented a barrier.

5.4.3 Summary of the barrier of late and inaccurate book reviews

The summary is compiled from the one contribution in the literature and the data collected from the target group:

The literature

* Rating of quality adequacy of reviews as barely adequate: 9,0 % to 22,0 % of the respondents.
* Rating of quality adequacy of reviews as not good enough: Up to 6,0 % of the respondents.

The target group

* Respondents who consider that not all important new publications are reviewed: 3,3 %.
* Most frequently mentioned indicator of reliability of reviews of new publications: 81-99 % reliability to 46,7 % of the target group.
* Respondents of the target group who experience publishing delay with book reviews: 16 respondents, i.e. 26,6 %.
* Respondents who find publishing delay for book reviews a barrier: 11 of 16 respondents, i.e. 68,8 % of the incidence group and 18,3 % of the target group.
* Percentage respondents who come across inaccurate descriptions of new publications in book reviews: 30,0.
* Respondents who consider inaccurate descriptions of new publications in book reviews a barrier: 72,2 % of the incidence group, i.e. 21,7 % of the target group.

As no extent of the barrier is reported by the literature, no comparison to the extent of the barrier as identified by the target group is possible. Certain general comments concerning the data collected from the target group can however be made: it appears that the greater majority of the important new publications are reviewed and that the reviews are considered reliable, and that only relatively few researchers experience a barrier with the delay of book reviews.

For compiling the list of the barriers in sequence of seriousness at the end of this chapter, the seriousness of this barrier is summarized as follows:

Seriousness of the barrier of late and inaccurate book reviews (Category B)

- Publishing delay with book reviews: 18,3.
- Inaccurate description of new publications in book reviews: 21,7.

5.5 BARRIER OF INCORRECT OR INCOMPLETE BIBLIOGRAPHIC REFERENCES

Identified by managers of LIS, this barrier, briefly described in 2.3.3, pertains to lacking, incomplete, incorrect, and unstandardized bibliographic references in publications.

The extent of the barrier is compiled from an overview of the extent of the barrier as identified in the literature, and as identified by the target group.

5.5.1 The barrier of incorrect or incomplete bibliographic references as identified in the literature

The extent of the barrier is compiled from an overview of the extent of lacking, incomplete, incorrect and unstandardized references, and the extent of the barrier as reported in the literature.

5.5.1.1 The extent of incorrect or incomplete bibliographic references

The presence of incorrect or incomplete references appears to be more widespread than at first suspected:

- Goodrich & Roland (1977), checking the accuracy of 2 195 references in ten major medical journals published in the United States, found 634, i.e. 28,9 %, erroneous references. The percentage errors within individual journals ranged from 14 % to 50 %.
- Key & Roland (1977), in their overview of the studies on errors in citations from 1911, report error rates ranging from 10,0 % (for a textbook on cancer), to 50,0 % for the references in the *Journal of the American Medical Association*. On checking the accuracy of 1 867 references in 129 articles accepted for publication by the *Archives of Physical Medicine and Rehabilitation*, these authors established an error rate of 54,0 %, a further 6,0 % of the referenced not being verifiable.
- Boyce & Banning (1979) found a citation error rate of respectively 13,6 % and 10,7 % for *Journal of the American Society for Information Science* and for *Personnel and Guidance Journal*.
- Thompson (1978:45), who calls incorrect references "a commom occupational hazard", also identifies incorrectly abbreviated references as another source of confusion.
- Although the incidence of incorrect or incomplete references was not specifically asked for by Burger (1987) in the study on the publishing of scientific articles, no respondents mentioned the presence thereof in the section on general comments or complaints.

5.5.1.2 The extent of the barrier of incorrect or incomplete bibliographic references

No contribution could be found in the literature describing the extent of the barrier, only the contribution by Gordon (1979:341-342) showing the extent to which papers, submitted to two prestigious physical science journals, are amongst other reasons, not recommended for acceptance because references were not given when required. Perturbing in this regard is the particularly high rejection rate for contributions from the deloping countries.

5.5.2 The seriousness of the barrier of incorrect or incomplete bibliographic references as identified by the target group (Q 10.8)

The 60 respondents were requested to indicate whether they came across either incorrect or incomplete bibliographic references in a) journal articles and b) in abstract & index journals, and if so, whether these references presented a barrier or not. Their responses are outlined in Table 14.

Table 14: Extent of the barrier of incorrect or incomplete bibliographic references

	EXTENT OF THE BARRIER							
	Do not know		Do not experience		No barrier		Presents a barrier	
Type of publication	No.	%	No.	%	No.	%	No.	%
Journal articles	0	0,0	16	26,7	12	20,0	32	53,3
Abstract & index journals	2	3,3	49	81,7	4	6,7	5	8,3

(Row totals = 100)

5.5.3 Summary of the barrier of incorrect or incomplete bibliographic references

As no relevant contributions on the extent of the barrier could be traced in the literature, the summary comprises only the data collected from the target group:

* Percentage respondents who come across incorrect or incomplete bibliographic references for journal articles: 73,3.
* Respondents who consider such references in journal articles a barrier: 72,7 % of the incidence group, i.e. 53,3 % of the target group.
* Percentage respondents who come across incorrect or incomplete references in abstract and index journals; 15,0.
* Respondents who consider such references in abstract and index journals a barrier: 55,6 % of the incidence group, i.e. 8,3 % of the target group.

Without an indication of the extent of the barrier from the literature no comparison to the extent of the barrier as identified by the target group is possible. A comparison of the incidence rates is also not possible, the literature (as recorded in 5.5.1.1) reporting from 10 % up to 54 % inaccurate references, as against the 73,3 % of the target group who came across such reference. The high rate of inaccurate references revealed by reliable surveys certainly is reason for concern. To a certain extent this concern is reflected by the 53,3 % of the target group who found inaccurate references a barrier.

For compiling the list of the barriers in sequence of seriousness at the end of this chapter, the seriousness of this barrier is summarized as follows:

Seriousness of the barrier of incorrect or incomplete bibliographic references (Category B)

- abstract and index journals: 8,3.
- journal articles: 53,3.

5.6 BARRIER OF INFERIOR INFORMATION QUALITY

This barrier, comprising the subbarriers repetitive information, inaccurate and obsolescent information, and information from inferior research, was identified in the literature and briefly described in 2.1.3 to 2.1.6.

Instead of testing the target group on the extent of this barrier in the generation or the presence of information of inferior quality, this barrier is limited to the quality of new information entering the LIS through the selection process. The literature search, however, tries to cover all the mentioned aspects. The reason for this choice is that while the existence of information of inferior quality outside the LIS does not, unless used, pose a potential barrier, the inclusion of such information into the formal information sources of the researcher is more likely to cause a potential barrier. Furthermore, this allows for a separate testing of the weeding of obsolete LIS bookstock dealt with under the barrier of obsolete and surplus publications in the LIS.

The data leading to the discussion on the extent of the barrier of inferior information quality involves an overview of the extent of the barrier as identified in the literature, and as identified by the target group.

5.6.1 The barrier of inferior information quality as identified in the literature

To determine the extent of the barrier, the literature was searched for contributions on the extent of information of inferior quality, the extent of acquisitions of information of inferior quality in the LIS and the extent of the barrier.

5.6.1.1 The extent of information of inferior quality

Repetitive information

The extent of repetitive information is indicated in the following four contributions:

- Jantsch (1965:31), quoting Knudsen, reports that only 10 % to 20 % of periodical articles contain original information, only 10 % of these articles are original and thus only one to two percent of the published material is original.
- Marloth (1970:253), referring to an unreferenced statement by the Working Group for Industrial Information of the International Federation for Documentation (FID), states that only 5 % of written documents contain previously unknown new findings;
- Stibic (1980:14) mentions that some authors estimate that only 10 % of the published literature contains new facts and ideas.
- Kaula (1984:4) mentions that the former director of the Swiss National Library in Bern stated in one of his investigations that in the field of science and technology, only 8 % of articles published are creative articles that add to the development of knowledge.

As far as inaccurate information is concerned, Gordon (1979:341) shows the extent to which articles submitted to two physical science journals were not recommended for acceptance because they contained demonstrable errors. Kirschenbaum (1981:264-265) provides examples of inaccurate data found in the published literarture.

The literature does not provide any insight intc the extent of obsolescent information or to information from inferior research.

5.6.1.2 The acquisition of information of inferior quality in the LIS and the extent of the barrier

The search of the literature did not yield any contributions on the extent of acquisitions by the LIS of repetitive information, inaccurate and obsolescent information and information from inferior research, nor did it indicate the extent of the barrier of inferior information quality.

5.6.2 The seriousness of the barrier of inferior information quality as identified by the target group (Q 9)

As it is considered important that the new acquisitions in the LIS should not include publications containing information of inferior quality, the barrier needs to be tested in detail. The respondents were thus asked

- whether they had come across new acquisitions that contained either repetitive, inaccurate, out of date information or information from inferior research, and if so,
- what the effect of information of inferior quality is on the acquisition of information,
- what the effect of information of inferior quality is on the project, and

- whether the extent of such information is decreasing, remaining constant or increasing.

5.6.2.1 The presence of information of inferior quality in acquisitions (Q 9.1)

The presence was tested by a simple 'Yes' or 'No' answer. The responses are reflected in Table 15.

Table 15: Presence of information of inferior quality in acquisitions

Type of information quality	PRESENCE OF INFORMATION OF INFERIOR QUALITY Do not know		Not present		Present	
	No.	%	No.	%	No.	%
Repetitive	1	1,7	17	28,3	42	70,0
Inaccurate/out of date	3	5,0	19	31,7	38	63,3
From inferior research	3	5,0	19	31,7	38	63,3

(Row totals = 100)

5.6.2.2 The effects of information of inferior quality (Q 9.2)

The effects of the three types of information quality were not tested separately by each type, but to save time, were tested as one effect, which was then tested on a) the acquisition of information and b) on the project. This combing however implies a change in the size of the target group, which becomes 45 as 14 respondents fell out by after indicating that they did not encounter any of the three categories of inferior information quality in the previous question and one respondent fell out because of the 'do not know' response. The 45 responses are outlined in Table 16 and 17.

Table 16: Type and extent of effects of information of inferior quality on the acquisition of information

Type of effect	EXTENT OF EFFECTS ON THE ACQUISITION OF INFORMATION Number N=45	%	Number N=60	%
No effect (1)	5	11,1	5	8,3
Delays the acquisition (2)	6	13,3	6	10,0
Increases effort (3)	30	66,7	30	50,0
Increases cost (4)	0	0,0	0	0,0
Eliminates accessibility/usability (5)	4	8,9	4	6,7
Subtotal	45	100	45	75,0
Do not experience information of low quality			15	25,0
TOTAL	45	100	60	100

This table shows that the most frequent effect of information of inferior quality on the acquisition of information is an increase in effort re-

quired. In the research environment this would mean that, for example, inferior information had to be checked for accuracy before it could be used.

The calculated weighted aggregative index for the effect of information of inferior quality on the acquisition of information comes to 42,4.

Table 17: Type and extent of effects of information of inferior quality on the research project

Type of effect	EXTENT OF EFFECTS ON THE PROJECT Number N=45	%	Number N=60	%
No effect (1)	5	11,1	5	8,3
Increases effort (2)	32	71,1	32	53,4
Increases cost (3)	0	0,0	0	0,0
Delays the project (4)	5	11,1	5	8,3
Decreases quality (5)	3	6,7	3	5,0
Subtotal	45	100	45	75,0
Do not experience information of low quality			15	25,0
TOTAL	45	100	60	100

The most frequent effect of inferior quality information is that increased effort is required. Such effort would involve the checking of inferior information for reliability.

The calculated weighted aggregative index for the effect of information of inferior quality on the research project comes to 34,7.

5.6.2.3 The trend of the barrier of inferior information quality

The trend of inferior information quality was tested separately for each of the three types of information (repetitive, inaccurate/out of date, and information of inferior research) The trends are outlined in Table 18.

Table 18: Trend of the barrier of inferior information quality

Type of information	TREND Decreasing (1) No.	%	Constant (2) No.	%	Increasing (3) No.	%	Dnk No.	%	Total No.	%
Repetitive	6	13,9	26	60,5	9	20,9	2	4,7	43	100
Inaccurate/ out of date	4	9,8	24	58,5	9	21,9	4	9,8	41	100
From inferior research	5	12,2	23	56,1	9	21,9	4	9,8	41	100

Expressed in terms of the target group, the three trends are interpreted as:

Repetitive information
- Decreasing: 10,0 %.
- Constant: 43,3 %.
- Increasing: 15,0 %.

Inaccurate/out of date information
- Decreasing: 6,6 %.
- Constant: 40,0 %.
- Increasing: 15,0 %.

Information from inferior research
- Decreasing: 8,3 %.
- Constant: 38,3 %.
- Increasing: 15,0 %.

The calculated weighted aggregative index (1 for decreasing, 2 for constant and 3 for increasing) for the trend comes to:
- Repetitive information: 47,2.
- Inaccurate/out of date information: 43,9.
- Information from inferior research: 43,3.

From this analysis it is clear that the most frequently mentioned trend is a constant one, i.e. that the seriousness of the barrier is remaining constant, but that, as second indicator, more respondents indicate an increasing than a decreasing trend.

5.6.3 Summary of the barrier of inferior information quality

The summary is compiled from the data as reported in the literature and as identified by the target group:

The literature
* Extent of new facts and ideas in published information: Range from 1 % to 10 %, i.e. about 90 % to 99 % of published information is repetitive information.

The target group
* Percentage respondents who came across the following types of information in acquisitions:
  - repetitive information: 70,0.
  - inaccurate/out of date information: 63,3.
  - information from inferior research: 63,3.
* Most frequent effect of information of inferior quality on the acquisition of information: Increases effort required; 66,7 % of the incidence group, i.e. 50,0 % of the target group.
* Average weighted index for effect of information of inferior quality on the acquisition of information: 42,4.
* Most frequent effect of information of inferio quality on the research project: Increases effort required; 71,1 % of the incidence group, i.e. 53,4 % of the target group.
* Average weighted index for effect of information of inferior quality on the research project: 34,7.
* Most frequent trend for:
  - repetitive information: Constant; 60,5 % of the incidence group, i.e. 43,3 % of the target group.
  - inaccurate/out of date information: Constant; 58,5 % of the incidence group, i.e. 40,0 % of the target group.
  - information from inferior research: Constant; 56,1 % of the incidence group, i.e. 38,3 % of the target group.
* Average weighted index for trend of information of inferior quality:
  - repetitive information: 47,2.

- inaccurate/out of date information: 43,9.
- information from inferior research: 43,3.

The literature comments on the extent of repetitive information as part of newly published information, whereas the target group commented on the extent of repetitive information as part of new acquisitions in the LIS. A comparison of these figures is meaningless. The awareness of the target group of the presence of repetitive information in new acquisitions is revealing. It does however not explain the seemingly unnecessary duplication of acquisitions (according to Table 8 page 59 primarily by the researchers themselves) nor does it explain their seemingly insatiable demands for more funds for publications. Does this indicate a lack of co-ordination in acquisition policy?

For compiling the list of the barriers in sequence of seriousness at the end of this chapter, the seriousness of this barrier is summarized as follows:

Seriousness of the barrier of inferior information quality (Category A)

Applying the formula s = f + e1 + e2 + t, the seriousness of the three parts of the barrier of inferior information quality comes to:

- repetitive information: 70,0 + 42,4 + 34,7 + 47,2 = 194,3.
- inaccurate/out of date information: 63,3 + 42,4 + 34,7 + 43,9 = 184,3.
- information from inferior research: 63,3 + 42,4 + 34,7 + 43,3 = 183,7.

5.7 BARRIER OF GAPS IN THE COLLECTION

This barrier, identified by researchers and briefly described in 2.2.4, pertains to important publications not held by the LIS.

The extent of the barrier is determined by establishing the extent as identified in the literature, and as identified by the target group.

5.7.1 The barrier of gaps in the collection as identified in the literature

The extent of the barrier as reported in the literature is compiled from an overview of the gaps in the collection of the LIS and the extent of the barrier.

The local literature, while indicating that the deficiencies in bookstock already exist for a long time, do not indicate the extent of these deficiencies (South Africa. Commission of Enquiry into University Finances and Salaries, 1951. Report, 1953, par. 91; Van Rooy, 1961:83; Kennedy, 1962:84; National Conference..., 1963:8). Some indication of gaps is reflected in the 1985 De Beer & Willemse (1986:16) survey at the University of South Africa, which established that 23 % of the unsatisfied requests were due to gaps in the collection, i.e. the requested material was not held. The comparable figures from the annual reports for 1986 and 1987 are 20 % and 14 % respectively (University of South Africa. Department of Library Services, 1987: Section 2.5).

The seriousness of the gaps emerges from the user survey conducted at the University of the Witwatersrand (1971a:2) where inadequate bookstock featured as the second most frequently mentioned barrier, after delays in ordering and processing new publications.

The extent of gaps in the collection can be gathered from some of the foreign contributions:

- Leonard, Maier & Dougherty (1969:223) in their user attitude survey established that the research needs were either always or usually satisfied by existing collections for 58 % of the respondents in universities, and for 37 % of the respondents in colleges. Ten percent of the respondents in colleges, and 4 % of the respondents in the universities indicated that their research needs were never or rarely satisfied by the collections. Going back to the first statistics, this could imply that about 42 % of the respondents in universities and 63 % of the respondents in colleges are not always or not usually satisfied by the existing collections.
- Slater (1984a:71) mentions that 12 % of her respodents recommended that more stock was required.

In spite of the many statements on the deficiencies of collections in the LIS, the literature does not indicate whether these gaps present a barrier, nor does it indicate the extent and the effects of the barrier.

Statistics on opinions of gaps must of course be treated with care, for it is unrealistic for researchers to expect that a LIS can supply all the required publications from its stock. Whereas a LIS could be expected to supply 'most' of the publications needed for a longitudional research programme from its own stock, self-sufficiency in publications required for a temporary research project should be considered unrealistic.

5.7.2 The seriousness of the barrier of gaps in the collection as identified by the target group (Q 7.4)

The extent of this barrier is tested in greater detail by determining
- whether there is a gap and if so, when last was it experienced;
- what the effect of the gap on the acquisitions of information is for research and on the project, and
- whether the gaps are decreasing, remaining constant or increasing.

Gaps in the collection is a general complaint of many researchers, staff and management. Because of differing opinions of the required level of self-sufficiency (as indicated above), it is difficult to accurately determine what constitutes a gap. To make the responses more realistic, the researchers of the target group were told that total self-sufficiency was unrealistic and that gaps pertained to essential publications that should bave been acquired.

The gaps in the following types of publications are covered: monographs, journals, abstract and index journals, dictionaries, directories and other reference tools, and foreign language publications.

5.7.2.1 The presence of gaps in the collection and when last experienced (Q 7.4.1)

In response to the question whether there are gaps in the bookstock and if so, when last was a gap experienced, the respondents provided the data as outlined in Table 19.

Table 19: Extent of gaps for monographs, journals, abstract and index journals, reference tools and foreign language publications

When experienced	EXTENT OF GAPS BY TYPE OF PUBLICATION Mono-graphs	Journals	Abstract & Index	Ref. tools	Foreign language
Gap experienced:					
longer than a year ago	1,7	0,0	0,0	0,0	1,7
during the last year	6,7	1,7	0,0	0,0	6,7
during the last 6 months	5,0	15,0	0,0	1,7	5,0
during the last 3 months	18,3	10,0	0,0	1,7	6,6
during the last month	20,0	36,7	0,0	6,6	3,3
during the last week	28,3	21,6	3,3	5,0	0,0
Subtotal:	80,0	85,0	3,3	15,0	23,3
Do not know	3,3	0,0	15,0	16,7	51,7
No gap experienced	16,7	15,0	81,7	68,3	25,0
Subtotal:	20,0	15,0	96,7	85,0	76,7

(Column totals = 100)

Thus 80,0 % of the respondents experienced a gap in monographs, 85,0 % in journals, 3,3 % in abstract and index journals, 15,0 % in reference tools, and 23,3 % in foreign language publications.

The following figures in this table should be emphasized: From the figures pertaining to when last a gap was experienced for monographs and journals (first two figure columns), it is evident that these gaps are frequently experienced: respectively 66,6 % and 68,3 % of the respondents experienced a gap during the last three months for monographs and for journals. This certainly indicates the need for an effective interloans system. The 15,0 % of the target group who did not know whether there were gaps in abstract and index journals on their field in the LIS probably do not consult these publications. They could be part of the 28,3 % of the target group who indicated that they do not consult abstract and index journals (Table 5 page 57). As these publications are essential for conducting research, being unknowledgeable of the gaps in the collection of abstract and index journals points either to no need for these tools to be consulted, or to the 'ignorance of information sources barrier'. The same comment could be made to the high percentage of respondents (51,7 %) not knowing whether there were gaps in foreign language publications in the LIS.

To establish whether the responses differ among the organizations, the extent of gaps is tabulated in Table 20 by organization and by type of publication. However many factors must be taken into consideration before such a comparison can be made, e.g. it can be expected that the respondents who frequently uses the LIS will report a higher incidence of gaps as well as a more recent experience of a gap than the infrequent user would. Thus it cannot be concluded that the organization with the highest percentage of respondents reporting gaps has the weakest collection. Interpretation of the figures in Table 20 should be handled with care, even when frequency of visit to the LIS (Table 7 page 58) is taken into consideration.

Table 20: Extent of gaps in the collection by organization and type of publication

Organization		PERCENTAGE RESPONDENTS REPORTING ON GAPS IN: Monogr.	Journals	Abst. & Ind. journals	Ref. tools	Foreign language
HSRC	Gap experienced	91,7	75,0	0,0	24,9	25,0
	No gap	8,3	25,0	83,3	58,3	25,0
	do not know	0,0	0,0	16,6	16,6	50,0
AEC	Gap experienced	83,4	83,4	0,0	0,0	33,3
	No gap	16,6	16,6	66,6	83,3	50,0
	do not know	0,0	0,0	33,3	16,6	16,6
SAIMR	Gap experienced	50,1	100,0	0,0	16,6	16,6
	No gap	16,6	0,0	100,0	66,6	50,0
	do not know	33,3	0,0	0,0	16,6	33,3
UP	Gap experienced	91,7	83,4	0,0	8,3	33,3
	No gap	8,3	16,6	83.3	66,6	0,0
	do not know	0,0	0,0	16,6	25,0	66,6
UWITS	Gap experienced	66,6	100,0	8,3	8,3	16,6
	No gap	33,3	0,0	83,3	75,0	33,3
	do not know	0,0	0,0	8,3	16,6	50,0
RAU	Gap experienced	83,4	75,0	8,3	25,0	16,6
	No gap	16,6	25,0	75,0	66,6	16,6
	do not know	0,0	0,0	16,6	8,3	66,6

The next step is to determine the effects of gaps in the collection.

5.7.2.2 The effect of gaps in the collection (Q 7.4.2.)

The effect of gaps on a) the acquisition of information and b) on the project, was not determined for each publication category but calculated cumulatively for gaps as a whole.

Table 21: Gaps in the collection: extent and type of effect on the acquisition of information

Type of effect	EXTENT OF EFFECT Number	%
No effect (1)	0	0,0
Delays information (2)	21	35,0
Increases effort (3)	28	46,7
Increases cost (4)	4	6,7
Eliminates accessibility (5)	5	8,3
Subtotal	58	96,7
No gap experienced	2	3,3
Do not know (0)	0	0,0
TOTAL	60	100

Publications which are not in the collection have to be acquired from another source. As reflected in the above table, this invariably has effects,

the most frequent effect being a delay in the acquisition of information (46,7 %) and an effect of increased cost (35,0 %), affecting 81,7 % of the target group.

The calculated weighted aggregative index for the effect of gaps on the acquisition of information comes to 55,7.

Table 22: Gaps in the collection: extent and type of effect on the research project

Type of effect	EXTENT OF EFFECT Number	%
No gap experienced	2	3,3
Do not know (0)	0	0,0
No effect (1)	4	6,7
Increases effort (2)	17	28,3
Increases cost (3)	2	3,3
Delays project (4)	28	46,7
Decreases quality (5)	7	11,7
TOTAL	60	100

Only 6,7 % of the target group responded that gaps in the collection did not affect their research project. The most frequent effect is a delay of the project, followed by an increase of required effort, these categories affecting 78,0 % of the target group. That 11,7 % of the respondents reported that gaps in the collection cause a decrease in the quality of the research project, serves also to show the potential seriousness of this barrier.

The calculated weighted aggregative index for the effect of gaps in the collection on the research project comes to 63,7.

5.7.2.3 The trend of gaps in the collection (Q 7.4.3)

To obtain an impression on the perceived trend of gaps in the bookstock, respondents were asked whether the extent of the gaps for the various types of publications was decreasing, remaining constant or increasing. The responses are presented in Table 23.

Table 23: Trend of gaps in the collection

Type of publication	No gap	Dnk	TREND OF GAPS Decreasing No.	%	Constant No.	%	Increasing No.	%
Monographs	20,0	5,0	9	15,0	24	40,0	12	20,0
Journals	15,0	3,4	9	15,0	29	48,3	11	18,3
Abstract and index journals	81,6	15,1	0	0,0	2	3,3	0	0,0
Reference tools	68,3	16,7	0	0,0	9	15,0	0	0,0
Foreign language	25,0	51,8	1	1,6	12	20,0	1	1,6

(Row totals for % = 100)

Clearly the most frequent trend here is a constant one, with more respondents indicating an increasing than a decreasing trend for gaps in the collection of monographs and journals.

The weighted aggregative index for the trend is calculated by using the number of respondents (percentages) in terms of the target group of 60, then weighting these responses with 1 for decreasing, 2 for constant and 3 for increasing, and dividing the product by three. This gives the following weighted averages for the various categories:

- Monographs: 51,7
- Journals: 56,5
- Abstract and index journals: 2,2
- Reference tools: 10,0
- Foreign language: 15,2.

5.7.3 Gaps in the national bookstock (Q 7.4.4; 7.4.5)

As LIS cannot be self-sufficient, they have to rely on the resources of other information systems. From the document delivery point of view it does not really matter whether the researcher receives his required information from the LIS of his own or from another institution, provided that the possible additional delay does not present a barrier. Thus it becomes necessary to determine also whether the gaps in the LIS of the own organization could be filled (by loan) from the LIS of other organizations. The respondents were thus asked:

a) Are the information sources not held by your LIS held by other services in the RSA, and if not, what percentage are not held?
b) When last was a publication you wanted to consult not in the RSA?

The respective responses are outlined in Tables 24 and 25.

Table 24: Extent to which required information sources are held by other LIS in the RSA

Frequency category (per cent)	EXTENT TO WHICH REQUIRED INFORMATION SOURCES ARE HELD	
	Number	%
Do not know	3	5,0
0 (Never)	0	0,0
1-20	27	45,0
21-40	5	8,3
41-60	4	6,7
61-80	3	5,0
81-99	9	15,0
100 (Always)	9	15,0
TOTAL	60	100

Broadly interpreted, this data shows that 45,0 % of the target group indicated that only up to 20,0 % of the required information sources requested from other LIS are held in the RSA, and 35,0 % indicated that more than 61,0 % of their information sources are held by other LIS in the RSA.

Table 25: Frequency distribution of when required publications were last not available in the RSA

Frequency category	DISTRIBUTION OF WHEN LAST NOT AVAILABLE IN THE RSA Number	%
Never	1	1,7
Longer than a year ago	5	8,3
During the last year	11	18,3
During the last 6 months	4	6,7
During the last 3 months	8	13,3
During the last month	9	15,0
During the last week	9	15,0
Subtotal	47	78,3
Not applicable	11	18,4
Do not know	2	3,3
TOTAL	60	100

5.7.4 Summary of the extent of the barrier of gaps in the collection

The summary of the barrier is compiled from the contribution in the literature and the data collected from the target group:

The literature

* Respondents whose research needs were never or rarely satisfied: 10 % in colleges and 4 % in universities.
* Percentage respondents recommending that more stock was required: 12.
* Percentage of requests not satisfied because of gaps in the collection: 14, 20 and 23 (University of South Africa...).

The target group

* Percentage respondents who experience a gap in:
  - monographs: 80,1
  - journals: 85,0
  - abstract and index journals: 3,3
  - reference tools: 15,0
  - foreign language publications: 23,3.
* Most frequently mentioned frequency of when last a gap in the collection was experienced
  - monographs: last week; 28,3 % of the target group.
  - journals: last month; 36,7 % of the target group.
* Most frequent effect on the acquisition of information: increased effort required; 48,3 % of the incidence group, i.e. 46,7 % of the target group.
* Average weighted index for the effect of gaps in the collection on the acquisition of information process: 55,7.
* Most frequent effect on the research project: delays the project; 48,3 % of the incidence group, i.e. 46,7 % of the target group.
* Average weighted index for the effect of gaps in the collection on the research project: 63,7.
* Most frequent trend of gaps for all types of publications: Constant.
* Average weighted index for the trend of gaps in the collection:
  - Monographs: 51,7
  - Journals: 56,5
  - Abstract and index journals: 2,2
  - Reference tools: 10,0

- Foreign language: 15,2.

* Most frequent extent to which required information sources are held by other LIS in the RSA :1-20 % of total requests; 47,4 % of the incidence group, i.e. 45,0 % of the target group.
* Most frequent distribution of when required publication was last not available in the RSA: during the last year; 23,4 % of the incidence group, i.e. 18,3 % of the target group.

Although a comparison of the extent of gaps as indicated in the literature and as collected from the target group is difficult to make, it would seem that the extent of gaps experienced by the target group is more serious than that reported in the overseas literature as well as those reported by the University of South Africa survey.

For compiling the list of the barriers in sequence of seriousness at the end of this chapter, the seriousness of this barrier is summarized as follows:

Seriousness of the barrier of gaps in the collection (Category A)

Applying the formula S = f + e1 + e2 + t, the seriousness of the barrier of gaps in the collection comes to:

- Monographs: 80,0 + 55,7 + 63,7 + 51,7 = 251,1.
- Journals: 85,0 + 55,7 + 63,7 + 56,5 = 260,9.
- Abstract and index journals: 3,3 + 55,7 + 63,7 + 2,2 = 124,9.
- Reference tools: 15,0 + 55,7 + 63,7 + 10,0 = 144,1.
- Foreign language: 23,3 + 55,7 + 63,7 + 15,2 = 157,9.

5.8 BARRIER OF COMPLEX ARRANGEMENT AND LAYOUT OF THE COLLECTION

This barrier, identified by researchers, was briefly described in 2.2.6 and pertains to the lack of an user-friendly arrangement, layout and organization of the LIS collection.

The extent of the barrier is indicated by the extent of the barrier as identified in the literature and as identified by the target group.

5.8.1 The barrier of complex arrangement and layout of the collection as identified in the literature

The extent of the barrier is compiled from the extent of uncondusive arrangement and layout of the collection, and the extent of the barrier as reported in the literature.

Only two contributions on the arrangement of the collection, both without an indication of the seriousness of the barrier, could be identified:

- In the library survey at the University of the Witwatersrand (1971a:3), the comment that more journals should be displayed ranked ninth of the twelve major recommendations.
- Slater (1984a:71) mentions that three percent of her respondents recommended that the physical arrangement of the collection and the material should receive attention.

5.8.2 The seriousness of the barrier of complex arrangement and layout of the collection as identified by the target group (Q 17.1)

Of the three comments submitted by researchers in 2.2.6, only the comment pertaining to publications not in their correct place on the shelves was included for testing, the other two comments being relatively isolated issues.

Considered as a minor barrier that does not require comprehensive testing, the respondents were asked whether they came across publications on the shelves which were not in their correct place, and if so, whether this was a barrier.

Of the 60 respondents, 23 (38,3 %) did not, and 37 (61,7 %) did come across publications on the shelves which were not in their correct sequence. To 28 of these respondents (75,7 %) this presented a barrier and to the remaining nine (24,3 %) it did not. Thus the publications not in their correct sequence on the shelves was perceived as a barrier by 46,7 % of the target group.

5.8.3 Summary of the barrier of complex arrangement and layout of the collection

The summary is compiled from one of the two contributions to the literature and from the data collected from the target group:

The literature

* Respondents who recommend that the arrangement of the collection should receive attention: 3 %.

The target group

* Percentage respondents who came across publications not in their correct sequence on the shelves: 61,7.
* Respondents to whom publications not in their correct sequence on the shelves presents a barrier: 75,7 % of the incidence group, i.e. 46,7 % of the target group.

Although a comparison between the seriousness of the barrier as identified from the literature and as reported by the target group is difficult to make, it seems as though the seriousness of this barrier is more pronounced in the target group than in the respondents covered by the literature.

For compiling the list of the barriers in sequence of seriousness at the end of this chapter, the seriousness of this barrier is summarized as follows:

Seriousness of the barrier of uncondusive arrangement and layout of the collection (Category B): 46,7.

5.9 BARRIER OF MISSING PUBLICATIONS

This barrier, pertaining to publications missing from the LIS, was identified by researchers and briefly described in 2.2.7.

The extent of the barrier is compiled from an overview of the barrier as identified in the literature and as identified by the target group.

5.9.1 The barrier of missing publications as identified in the literature

The literature offers several indications of the extent of missing publications:

- The 1966 library reader failure survey at Durham University established that 8 % of failures could not be accounted for and 2 % were missing (Burnett, 1967:148-149).
- During the 1969 library stocktaking of publications at the University of the Witwatersrand, 4 700 of the 49 500 publications covered, i.e. 9,5 %, were reported missing. During the subsequent stocktaking a year later, 20 % of the missing publications could be traced, leaving a loss of

3 760 publications, i.e. 7,6 % of the sections covered. (University of the Witwatersrand, Libraries, 1970:1; 1971b).

- The 1970 Lancaster University Library system analysis showed that of the publications not available, 6,8 % were missing (Buckland et al. 1970:32; Buckland, 1975:44).
- The surveys of Urquhart & Schofield (1971:276; 1972:236) to determine the extent of reader's failure at the shelves, established a publication missing rate of from 2 % to 20,5 %.
- The 1972 survey of the University of Port Elizabeth, as reported in entry 41 of *Register of Investigations into Librarianship in Southern Africa* (Haag, 1986:11), established that 1,5 % of the bookstock was missing.
- Measuring causes of user frustration in an academic library, Saracevic, Shaw & Kantor (1977:16) established that respectively 8 % and 12 % of the books were missing in their 1972 and 1974 survey.
- The 1983 periodical access survey at the University of British Columbia Library system established that whereas 8,09 % of the periodicals could not be immediately located, 1,32 % could not be found and an additional 0,37 % were declared missing. During their 1984 survey of heavily used periodicals held by the science division, 1 % of the periodicals covered could not be found (Watson, 1984:497).
- The 1985 capability study by the University of South Africa to supply required publications established that about 2 % of the publications that could not be traced were missing whereas no definite reason could be established for a further 10 % of the requests not traced; 48 of the 127 publications that could not be supplied, i.e. nearly 38,0 %, were for teaching and research purposes. (De Beer & Willemse, 1986:16). The percentage missing publications, as reflected in the annual reports, is 3 % for 1986 and 2 % for 1987 (University of South Africa. Department of Library Services, 1987: Section 2.5).
- The statistical analyses of interloans for 1985 at the HSRC indicated that of the 890 received requests that could not be provided, 49 (i.e. 5,5 %) could not be provided because they were missing when the request was received (Miller & Gouws, 1986:8).

As concerns the seriousness of the barrier of missing publications, three contributions could be traced in the literature:

- The user survey conducted at the University of the Witwatersrand Libraries (1971a:2) to comment on present services, showed that the missing publications problem ranked fourth of twelve comments with academic staff, after delays with ordering procedures, inadequacy of book and journal stock, and general service inefficiency.
- From 10 % to 30 % of the publications reported missing during the 1969 stocktaking at the University of the Witwatersrand Libraries (1970:3) should be replaced immediately for the postgraduate programme, ndicating the value of the missing publications for research.

The literature does not offer any further indication on the extent of the barrier of missing publications.

5.9.2 The seriousness of the barrier of missing publications as identified by the target group (Q 17.2)

The barrier was tested by asking the respondents whether some of the publications of the LIS are missing when they required them, and if so, whether this constituted a barrier to them or not.

Of the target group, 16 respondents (26,7 %) reported that they had not encountered requested publications that were missing while 44 respondents

(73,3 %) had. To 41 of the latter group of respondents (93,2 %) missing publications presented a barrier and to the remaining three (6,8 %) of the incidence group, i.e. 5,0 % of the target group, it did not. This implies that the barrier of missing publications was experienced by 68,3 % of the target group.

5.9.3 Summary of the barrier of missing publications

The summary reflects the range from the lowest to the highest percentage for missing publications as recorded in the literature, and the data collected from the target group.

The literature

* Range of missing publications: From 1,3 % to 20,5 %. The latter figure however, pertains to books used mainly by students and cannot be regarded as truly representative.

The target group

* Percentage respondents who requested publications that could not be found: 73,3.
* Respondents who experience missing publications as a barrier: 93,2 % of the incidence group, i.e. 68,3 % of the target group.

A comparison between the extent of the barrier as identified from the literature and as collected from the target group is difficult. The findings as reported in the literature are based on well-executed surveys and include only publications missing. Excluded are the temporarily missing publications that might be out on loan, are in use in the reading room, are at the binders, are being re-catalogued, are misshelved, or were looked for in the wrong place on the shelves - all categories that were probably included in the responses of the target group. It is thus not surprising that the statistics for the extent of the barrier as reported by the target group are far higher than those refering to the users covered by the literature. That 73,3 % of the target group reported missing publications and that this caused a barrier to 93,2 % of these respondents, irrespective of whether these statistics pertain only to publications really missing or to temporarily missing publications, shows the extent to which access to required publications can be impeded.

For compiling the list of the barriers in sequence of seriousness at the end of this chapter, the seriousness of this barrier is summarized as follows:

Seriousness of the barrier of missing publications (Category B): 68,3.

5.10 BARRIER OF OBSOLETE AND SURPLUS PUBLICATIONS IN THE LIS

This barrier, pertaining to obsolete and surplus publications in the LIS, i.e. material that should be weeded, was identified by managers of LIS and briefly described in 2.3.2.

The extent of the barrier is compiled from the extent as identified in the literature and as identified by the target group.

5.10.1 The barrier of obsolete and surplus publications in the LIS as identified in the literature

The barrier is compiled from an overview of the extent of obsolete and surplus publications in the LIS and the extent of the barrier.

The literature reports surprisingly little on the presence and the extent of obsolete and surplus publications, i.e. publications that can be weeded from the collection.

- Malan (1973:43) mentions that weeding in South African libraries has been negligible and that it can be assumed that much of the national bookstock is superseded, outdated and without value.
- The stocktaking at the University of the Witwatersrand Libraries (1970:3) established that from 25 % to 35 % of the lost items need not be replaced.
- Applying the standard weeding criteria of age of the publication and the last date of circulation, Fisher (1985:31,33) establishes that 8 % of the academic business and economics collection at the California State University was weedable based on age and 30 % based on past use.
- Slater (1984a:71) mentions that 10 % of her respondents recommended that the quality level and relevance of stock should be improved, and 7 % recommended that the updating and recency of stock needed attention.

The literature does not report any contribution on the extent of the barrier of obsolete and surplus publications in the LIS.

5.10.2 The seriousness of the barrier of obsolete and surplus publications in the LIS as identified by the target group (Q 8)

This barrier was tested for presence, effects and trend.

5.10.2.1 The presence of obsolete and surplus publications in the LIS (Q 8.1)

Of the 60 respondents, seven (11,7 %) did not know whether the collection contained obsolete and surplus publications or not, 32 respondents (53,3 %) replied that it did not, and the remaining 21 respondents (35,0 %) that it did.

5.10.2.2 The effects of obsolete and surplus publications in the LIS on the acquisition of information.

While every acquisition of information process involves a selection on quantity and quality of information, the presence of obsolete and surplus publications in the LIS implies that the researcher has to search for his wheat amongst the chaff.

The 21 respondents who experienced obsolete and surplus publications in the LIS collection, indicated the following effects (expressed as percentage of the incidence group) on the acquisition of information and on the research project (Tables 26 and 27).

Table 26: Obsolete and surplus publications in the LIS: type and extent of effect on the acquisition of information

Type of effect	EXTENT OF EFFECT ON THE ACQUISITION OF INFORMATION N=21	%	N=60	%
No effect (1)	6	28,5	6	10,0
Delays the acquisition (2)	3	14,3	3	5,0
Increases effort required (3)	10	47,6	10	16,7
Increases cost (4)	0	0,0	0	0,0
Eliminates accessibility/usability (5)	1	4,8	1	1,6
Subtotal	20	95,2	20	33,3
Not experienced	0	0,0	39	65,0
Do not know (0)	1	4,8	1	1,7
TOTAL	21	100	60	100

The main effect of obsolete and surplus publications on the shelves of the LIS is recorded as 'increased effort required'. Such effort would involve the sifting of relevant information from the irrelevant, and might make the finding of a particular publication on the shelves more time-consuming because it is arranged amongst other publications which are obsolete or surplus.

The calculated weighted aggregative index for the effect of obsolete and surplus publications on the acquisition of information comes to: 1x10+2x5+3x16,7+5x1,6 = 78,1 divided by 5 = 15,6.

Table 27: Obsolete and surplus publications in the LIS: type and extent of effect on the research project

Type of effect	EXTENT OF EFFECT ON THE RESEARCH PROJECT N=21	%	N=60	%
No effect (1)	10	47,6	10	16,7
Increases effort required (2)	7	33,3	7	11,7
Increases cost (3)	0	0,0	0	0,0
Delays the project (4)	0	0,0	0	0,0
Decreases the quality (5)	3	14,3	3	5,0
Subtotal	20	95,2	20	33,4
Not experienced	0	0,0	39	65,0
Do not know (0)	1	4,8	1	1,6
TOTAL	21	100	60	100

Obsolete and surplus publications on the shelves can lead to the inclusion of superseded or inaccurate information in the research project, which in turn may invalidate the research findings. The extent of the effects however, as experienced by the target group, are primarily 'no effect' possibly indicating that researchers are knowledgeable enough to recognize and to avoid the use of obsolete and surplus publications in the LIS.

The calculated weighted aggregative index for the effect of obsolete and surplus publications on the research project comes to 13,0.

5.10.2.3 The trend of obsolete and surplus publications in the LIS

The 21 respondents viewed the trend of obsolete and surplus publications in the LIS as outlined in Table 28.

Table 28: Trend of obsolete and surplus publications in the LIS

Type of trend	EXTENT OF TREND N=21	%	N=60	%
Increasing (3)	7	33,3	7	11,7
Constant (2)	10	47,7	10	16,7
Decreasing (1)	2	9,5	2	3,3
Not involved	0	0,0	39	65,0
Do not know (0)	2	9,5	2	3,3
TOTAL	21	100,0	60	100

The most frequent trend is therefore constant, with more respondents indicating an increasing than a decreasing trend.

By weighting the percentage responses of the target group with 3 for increasing, 2 for constant, and 1 for the decreasing trend, the weighted aggregative index for the trend comes to 23,9.

5.10.3 Summary of the barrier of obsolete and surplus publications in the LIS

The summary is compiled from the contributions in the literature and from the data as collected from the target group:

The literature

* The range of obsolete and surplus publications in the LIS, as outlined in 5.10.1, varies from 8 % to 35 %.
* Respondents recommending that the quality level and relevance should be improved: 10 %.
* Respondents recommending that the updating and recency of stock needed attention: 7 %.

The target group

* Percentage respondents who experience obsolete and surplus publications in the LIS: 35,0.
* Most frequent effect of obsolete and surplus publications on the acquisition of information: Increased effort required to obtain information; 47,6 % of the incidence group, i.e. 16,7 % of the target group.
* Average weighted index for effect of obsolete and surplus publications on the acquisition of information: 15,6.
* Most frequent effect of obsolete and surplus publications on the research project: No effect; 47,6 % of the incidence group, i.e. 16,7 % of the target group.
* Average weighted index for effect of obsolete and surplus publications on the research project: 13,0.
* Most frequent trend: Constant; 47,7 % of the incidence group, i.e. 16,7 % of the target group.

* Average weighted index of trend for obsolete and surplus publications: 23,9.

Whereas the first mentioned contribution to the literature reports on the percentage of obsolete and surplus publications in libraries, the statistics collected from the target group express the percentage of respondents who experienced obsolete and surplus publications in the LIS. These statistics are therefore not comparable. It can however be assumed that the 35,0 % of the respondents in the target group who experienced obsolete and surplus publications in the LIS would most likely recommend that such publications should be attended to. This statistic could, academically at least, be compared to the two contributions in the literature which show that 10 % and 7 % of the respondents respectively recommend that the quality level and updating of the stock needed attention. The extent of obsolete and surplus publications experienced by the target group is thus possibly more pronounced than that reported in the quoted literature.

For compiling the list of the barriers in sequence of seriousness at the end of this chapter, the seriousness of this barrier is summarized as follows:

Seriousness of the barrier of obsolete and surplus publications in the LIS (Category A)

Applying the formula s = f + e1 + e2 + t, the seriousness of the barrier of obsolete and surplus publications in the LIS comes to: 35,0 + 17,6 + 13,0 + 23,9 = 89,5.

5.11 FOREIGN LANGUAGE BARRIER

The foreign language barrier, pertaining to publications issued in a language the researcher cannot read, was identified through the literature and briefly described in 2.1.13.

The extent of the barrier is compiled from the extent as identified in the literature and as identified by the target group.

5.11.1 The foreign language barrier as identified in the literature

The extent of the barrier is gathered from the proportion of foreign language publications to which no access is gained, and the extent of the barrier.

5.11.1.1 The extent of foreign language publications to which no access is gained.

The extent to which no access is gained is revealed by the following contributions to the literature:

- Wood (1967:123, 128), asking his respondents whether they had recently come across a paper in a foreign language which they would have liked to read but could not because of the language barrier, established that from 54,6 % to 80,4 % of the respondents in the various disciplines, with an average of 76,8 % for all disciplines covered, answered in the affirmative. As to the recentness of this disability, 16,5 % of the reacting respondents encountered such a foreign language publication within the last week, 47,7 % between a week and a month ago, and 35,8 % between a month and a year ago. In so far as the provision of organized translating facilities was concerned, industrial, research and government organizations paid more attention to the foreign language problem than academic institutions.

- In their Lancaster University survey, Stuart & Walker (1970:54-54) established that 32 % of the staff approached needed translations, with a frequency requirement of once a year for 47 %, once a term for 46 %, and once a month for 7 % of the respondents.
- In their Sheffield University survey, Hutchins, Pargeter and Saunders (1971a:57-58; 1971b:7-8) show clearly that a high proportion of researchers suspect that they may be missing important research beacause of the foreign language barrier. Of their respondents, 31 % replied that they were or were probably missing such important research and a further 28 % thought they possibly were missing such research.
- In assessing the amount of potential useful material denied to the researcher in the social sciences and the humanities because of language difficulties, Ellen (1979:35,37) established that from 61 % to 91 % of the respondents in the various disciplines, with an average of 76 % of all respondents, encountered a foreign language publication which they wanted to but could not read. In spite of these responses, a surprisingly high proportion of her respondents, 47 %, expressed their satisfaction with access to foreign language material, the highest dissatisfaction level being recorded by university researchers, of whom 39 % were dissatisfied.
- In the Royal Society *Study of the scientific information system in the U.K.* (1981:27-28),from 19 % to 67 % of the respondents indicated that they come across references to material published in foreign languages. From 25 % to 70 % of the respondents were of the opinion that a researcher could safely confine himself to the English-language without risk of missing much important material.
- Gordon & Santman (1981:188) established that 21 % of the British and 58 % of the Dutch biochemists, 32 % of the British and 58 % of the Dutch numerical control engineers and 46 % of the British and 60 % of the Dutch social scientists could not read the foreign language journals in their field.

5.11.1.2 The extent of the foreign language barrier

The extent of the foreign language barrier depends on several factors:
- the amount of relevant publications issued in foreign languages and the importance of that literature to the researcher;
- the linguistic ability of the researcher;
- the availability of a translation service, its effectiveness, speed and tariff structure.

Because of the extensive amount of details available on these aspects, and because a review of these details is a lengthy method of attaining an overview of the barrier, the individual aspects are not investigated but the litarature scanned for contributions on the combined effect of these aspects.

In spite of the many contributions to the literature,only three contributions that mention the extent of the foreign language barrier could be found:
- Peters (1975:87), in his survey of cultural and language obstacles in information transfer, established that 20 % of his scientific and technical respondents reported language as an obstacle.
- Ellen (1979:37), assessing the level of satisfaction with access to foreign language material, mentions that 47 % of her respondents were dissatisfied with the present situation.
- Large (1983:ix) notes that the foreign language barrier probably poses the biggest current threat to scientific communication.

The literature also provides several indications as to whether the extent of the barrier is decreasing, remaining constant or is increasing:

- Ellen (1979:31-32, 38), in comparing the findings of the 1965 National Lending Library for Science and Technology survey to a similar survey conducted 13 years later, established that the proportion of scientists and technologists capable of dealing with foreign languages themselves had declined and concludes that the situation with regard to the foreign language barrier in Britain has not improved.
- Van Bergeijk (1976:162; 1981:173) and Risseeuw (1981:18) both maintain that the influence of the foreign language barrier is increasing.
- According to Wood (1967:120,122) and Ellen (1979:32), the claimed language proficiency seems to be higher in the upper age groups. This proficiency might however not be due to an accumulation of foreign language proficieny with age and experience, but rather because linguistic skills are not being taught or acquired as widely as they were before. With a declining language proficiency and an ever increasing use of different languages, the extent of the foreign language barrier can only increase.
- Galinski (1984:153), noting a greater number of contributions from Japan, predicts an increasing foreign language barrier for this language in Europe.

5.11.2 The seriousness of the foreign language barrier as identified by the target group (Q 12)

Being a 'major' barrier, the extent of the barrier was tested in greater detail by establishing

- the extent of important information in a language that could not be read;
- the extent of access gained to such information;
- when last information could not be read because it was written in a foreign language;
- the effects of not being able to read foreign language publications on the acquisition of information and on the research project; and
- the trend of access to foreign language information.

5.11.2.1 The extent of important information in a foreign language that could not be read (Q 12.1)

Of the 60 respondents, 49, i.e. 81,7 % had, and the remaining 11 respondents (18,3 %) had not, come across important information in a foreign language that they could not read. Three of the 11 respondents in the latter group (all in medicine) indicated that all important contributions on their subject were published in English and that they did not require access to contributions in other languages.

The extent to which access was obtained to important information in a foreign language that could not be read is reflected in Table 29.

Table 29: Extent of access gained to important information issued in a foreign language

Access category	EXTENT OF ACCESS GAINED TO IMPORTANT INFORMATION ISSUED IN A FOREIGN LANGUAGE N=49	%	N=60	%
No access gained	25	51,0	25	41,7
1-20 % access	9	18,4	9	15,0
21-40	4	8,2	4	6,7
41-60	2	4,1	2	3,3
61-80	1	2,0	1	1,7
81-99	8	16,3	8	13,3
Full access gained	0	0,0	11	18,3
TOTAL	49	100	60	100

Thus 18,3 % of the target group had full access to important foreign language information and 41,7 % had no access. Making the cut-off point for insufficient access at 40 % access implies that 36,6 % of the target group had sufficient access and 63,4 % had insufficient access. In the absence of a specific question in the questionnaire as to whether the absence or insufficient access caused a barrier or not, the 63,4 % is taken as the barrier rate for the target group. Considering that several LIS in the RSA have acquisition policies that discourage the acquisition of foreign language publications that cannot be read by their researchers, the extent of no access or of limited access would most probably have been higher if more of the required foreign language publications had been acquired. (Table 19 page 84 showed that 23,3 % of the target group experienced a gap in foreign language publications in the LIS, and the responses to question 7.3 of the questionnaire 'do you prefer not to purchase publications written in a language you cannot read?', drew a 78,3 % affirmative response).

5.11.2.2 When last important foreign language information could not be used

The distribution of the 49 responses to the question when last important information could not be used because it was written in a language that could not be read, is outlined in Table 30.

Table 30: Frequency distribution of when last important foreign language information could not be used

Frequency	EXTENT OF ACCESS NOT OBTAINED Number	%
Do not know	1	2,0
Longer than a year	8	16,3
During the last year	9	18,4
During the last 6 months	12	24,5
During the last 3 months	7	14,3
During the last month	7	14,3
During the last week	5	10,2
TOTAL	49	100

Thus 38,8 % of the respondents could not use some important foreign language publication during the last three months, and 63,3 % during the last six months.

5.11.2.3 Effects of not being able to use important foreign language information

The type of effects on the acquisition of information and on the research project by not being able to use important foreign language information are outlined in Tables 31 and 32 respectively.

Table 31: Effects of not being able to use important foreign language information on the acquisition of information

Type of effect	EXTENT OF THE EFFECTS ON THE ACQUISITION OF INFORMATION N=49	%	N=60	%
Do not know (0)	1	2,0	1	1,7
Increases effort required (3)	8	16,4	8	13,3
Increases cost (4)	1	2,0	1	1,7
Eliminates accessibility (5)	39	79,6	39	65,0
Not involved	0	0,0	11	18,3
TOTAL	49	100	60	100

The calculated weighted average for the effect on the acquisition of information of not being able to use important foreign language information comes to: 74,3.

Table 32: Effects of not being able to use important foreign language information on the research project

Type of effect	EXTENT OF THE EFFECTS ON THE RESEARCH PROJECT N=49	%	N=60	%
Do not know (0)	3	6,1	3	5,0
No effect (1)	2	4,1	2	3,3
Increases effort required (2)	7	14,3	7	11,7
Increases cost (3)	2	4,1	2	3,3
Delays the project (4)	1	2.0	1	1,7
Decreases the quality (5)	34	69,4	34	56,7
Not involved	0	0,0	11	18,3
TOTAL	49	100	60	100

It is of course difficult for the respondent to express an opinion on the importance of foreign language information to which no access can be gained. It is easier to surmise that, in the face of limited foreign language proficiency in the RSA and the lack of translation services, that the effects must be severe. Whereas most of the other barriers can be circumnavigated in one or other way, the alternative options available to

the local researchers, e.g. translations, are limited, costly, time-consuming and most probably not satisfactory.

The calculated weighted average for the effect on the research project of not being able to use important foreign language information comes to 65,4.

5.11.2.4 Trend of the extent to which no access to important foreign language information is gained

The trend to which no access is gained is outlined in Table 33.

Table 33: Trend of extent to which no access to important foreign language information is gained

Type of trend	EXTEND OF TREND N=49	%	N=60	%
Do not know (0)	2	4,0	2	3,4
Increasing (3)	5	10,2	5	8,3
Constant (2)	38	77,6	38	63,3
Decreasing (1)	4	8,2	4	6,7
Not involved	0	0,0	11	18,3
TOTAL	49	100	60	100

This indicated that the most frequent trend to which no access to foreign language information is gained is constant, with a slightly higher indication for an increasing than for a decreasing trend.

The calculated weighted aggregative index for the trend for foreign language publications to which no access is gained comes to 52,7.

5.11.3 Summary of the foreign language barrier

The summary reflects the extent of the foreign language barrier as reported in the literature and as identified by the target group:

The literature

* Percentage respondents to whom foreign language presents a barrier in information transfer: 20 %.

The target group

* Percentage respondents who come across important information in a foreign language to which they have partial or no access: 63,4.
* Most frequently mentioned extent of access gained to important information in a foreign language: No access: 51,0 % of the incidence group, i.e. 41,7 % of the target group.
* Most frequently mentioned frequency when last important information in a foreign language could not be used: During the last six months - 24,5 % of the incidence group, i.e. 20,0 % of the target group.
* Most frequent effect of not being able to use important foreign language information on the acquisition of information: Eliminates accessibility - 79,6 % of the incidence group, i.e. 65,0 % of the target group.
* Average weighted index for the effect of not being able to use important foreign language information on the acquisition of information: 74,3.
* Most frequent effect of not being able to use important foreign language information on the research project: Decreases the quality of the project - 69,4 % of the incidence group, i.e. 56,7 % of the target group.

* Average weighted index for the effect of not being able to use important foreign language information on the research project: 65,4.
* Most frequent trend of foreign language information to which no access is gained: Constant - 77,6 % of the incidence group, i.e. 63,3 % of the target group.
* Average weighted index for the trend of not being able to use important foreign language information: 52,7.

A comparison between the extent of this barrier as indicated in the literature (20 % of the respondents) and the extent as identified by the target group, is unfortunately not possible, as no such data was collected from the target group. However if those respondents who could not get access are equated to those who experienced the barrier, then according to Table 29, 41,7 % of the respondents would fall into this category. Including the next two cateories (those with 1-40 % access), would imply that 63,4 % of the respondents may have experienced the barrier.

For compiling the list of the barriers in sequence of seriousness at the end of this chapter, the seriousness of this barrier is summarized as follows:
Seriousness of the foreign language barrier (Category A)
Applying the formula $s = f + e1 + e2 + t$, the seriousness of the foreign language barrier comes to: $63,4 + 74,3 + 65,4 + 52,7 = 255,8$.

5.12 BARRIER OF INADEQUATE SUBJECT-INDEXING LEVEL

This barrier, pertaining to the adequacy of the indexing level of the subject catalogue, was identified by managers of LIS and briefly described in 2.3.4.

The extent of the barrier of inadequate subject-indexing level is gathered from the extent of the barrier as identified in the literature and as identified by the target group.

5.12.1 The barrier of inadequate subject-indexing level as identified in the literature

The extent of the barrier is determined by gathering details from the literature on the extent of inadequate indexing and on the extent of the barrier.

In the literature only two contributions to inadequate subject-indexing could be traced:
- In an indirect reference by Martyn (1964a:13) to indexing failures in library or published indexes as a cause for late finds of information, indexing failures caused late finds in 3 % of the instances. The repeat survey of 1985/86, reports an incidence rate of 15 % (Martyn, 1987:17).
- Whereas the users indicated a tentative acceptance of the catalogue, 6,9 % of the respondents in the survey by Leonard, Maier & Dougherty (1969:227) indicated that the catalogue was either never or rarely sufficiently indexed to permit retrieval, whereas 78,4 % indicated that it was either usually or always sufficiently indexed.

The literature provides no further indication on the extent of inadequate subject-indexing, nor of the extent of the barrier.

5.12.2 The seriousness of the barrier of inadequate subject-indexing level as identified by the target group (Q 11)

The extent of the barrier was determined by establishing

- whether the subject catalogue provides access to detailed information and if not, what percentage of required access can it provide;
- the effects of limited access to detailed information on the acquisition of information for research and on the research project, and
- the trend of accessibility to detailed information through the subject catalogue.

5.12.2.1 Degree of access to detailed information provided by the subject catalogue (Q 11.1)

Of the 60 respondents, 31 (51,7%) indicated that they did not use the subject catalogue of the LIS, 10 respondents (16,6 %) mentioned that it always provided access, and 19 respondents (31,7 %) that it did not always provide access to detailed information.

Of the 31 respondents who did not use the subject catalogue, 17 respondents, without being asked, indicated the following reasons for non-use (number of respondents indicated in brackets):

- The subject catalogue did not offer sufficient detailed access (7)
- No need to use the subject catalogue as the class numbers are known (4)
- Computer searches preferred (2)
- Prefer to use abstracts (1)
- Takes too long to use the subjext catalogue (1)
- Do not know how to use it (1)
- Do not know that it exists (1).

Of these comments pertain to other barriers and will be discussed in conjunction with those barriers.

The distribution of access for the 29 respondents who gained either partial or complete access follows in Table 34.

Table 34: Extent of access to detailed information provided by the subject catalogue

Access category (%)	EXTENT OF ACCESS TO DETAILED INFORMATION N=29	%	N=60	%
1-20	3	10,3	3	5,0
21-40	4	13,8	4	6,7
41-60	2	6,9	2	3,3
61-80	8	27,6	8	13,3
81-99	2	6,9	2	3,3
Total access	10	34,5	10	16,7
Do not use the catalogue	0	0,0	31	51,7
TOTAL	29	100	60	100

From this table it can, for example, be seen that the subject catalogue provides up to 40 % access to 11,7 % of the respondents and that 16,7 % of the respondents obtain total access. However, because of its high non-use (51,7 % in Table 34), the overall access capability remains relatively low.

5.12.2.2. The effects of limited access to detailed information in the subject catalogue on the acquisition of information

The following effects were reported by the 19 respondents who did not get full access to detailed information in the subject catalogue:

Table 35: Type and extent of effects of limited access to detailed information in the subject catalogue on the acquisition of information

Type of effect	EXTENT OF EFFECTS OF LIMITED ACCESS ON THE ACQUISITION OF INFORMATION N=19	%	N=60	%
No effect (1)	2	10,5	2	3,3
Increases effort required (3)	14	73,7	14	23,3
Eliminates accessibility/usability (5)	3	15,8	3	5,0
Acquire total access	0	0,0	10	16,7
Do not use the catalogue	0	0,0	31	51,7
TOTAL	19	100	60	100

Using the percentage responses of the target group, the calculated weighted average for the effect of limited access to detailed information in the subject catalogue on the acquisition of information process comes to 19,6 (1x3,3+3x23,3+5x5,0=98,2 divided by 5 = 19,64).

5.12.2.3 The effects of limited access to detailed information in the subject catalogue on the research project

The 19 respondents who did not get full access to detailed information in the subject catalogue reported the following effects on the research project:

Table 36: Type and extent of effects of limited access to detailed information in the subject catalogue on the research project

Type of effect	EXTENT OF EFFECTS OF LIMITED ACCESS ON THE PROJECT N=19	%	N=60	%
No effect (1)	3	15,8	3	5,0
Increases effort required (2)	9	47,3	9	15,0
Increases cost (3)	1	5,3	1	1,7
Delays the project (4)	4	21,1	4	6,6
Decreases the quality (5)	2	10,5	2	3,3
Acquire total access	0	0,0	10	16,7
Do not use the catalogue	0	0,0	31	51,7
TOTAL	19	100	60	100

The most frequent effect is 'increased effort required'.It can be argued that this effect should be more serious than recorded, for if no access is

obtained it might imply a decrease of the quality of the research project. But then it is difficult to assess the effect of information to which no access was obtained.

The calculated weighted average for the effect of limited access to detailed information in the subject catalogue on the research project comes to 16,6.

5.12.2.4 The trend of accessibility to detailed information through the subject catalogue

The responses of the 19 respondents to the question whether accessibility to detailed information through the subject catalogue was decreasing, remaining constant or improving are outlined in Table 37.

Table 37: Trend of accessibility to detailed information in the subject catalogue

Type of trend	EXTENT OF TREND N=19	%	N=60	%
Increasing (3)	2	10,5	2	3,3
Constant (2)	14	73,7	14	23,3
Decreasing (1)	3	15,8	3	5,0
Acquire total access	0	0,0	10	16,7
Do not use the catalogue	0	0,0	31	51,7
TOTAL	19	100	60	100

The most frequent trend is thus constant, with a slightly higher decreasing response than an increasing response. But considering the high percentage of non-use, these indicators are not fully representative.

The calculated weighted average for the trend of limited access to detailed information in the subject catalogue comes to 20,5.

5.12.3 Summary of the barrier of inadequate subject-indexing level

The summary of the extent of the barrier is compiled from the contributions to the literature and from the data collected from the target group:

The literature

* Respondents who find that the catalogue was never or rarely sufficiently indexed to permit retrieval: 6,9 %.

The target group

* Percentage respondents who did not use the subject catalogue: 51,7.
* Respondents who did not always obtain detailed access from the subject catalogue: 65,5 % of the incidence group, i.e. 31,7 % of the target group.
* Respondents who always obtain detailed access from the subject catalogue: 34,5 % of the incidence group, i.e. 16,7 % of the target group.
* Respondents who usually (81-100 %) obtain access: 20,0 %.
* Most frequent effect of limited access to information in the subject catalogue on the acquisition of information for research: Increases effort required to obtain information - 73,7 % of the incidence group, i.e. 23,3 % of the target group.

* Average weighted index for the effect of limited access to information in the subject catalogue on the acquisition of information for research: 19,6.
* Most frequent effect of limited access to information in the subject catalogue on the research project: increases effort required - 47,3 % of the incidence group, i.e. 15,0 % of the target group.
* Average weighted index for the effect of limited access to information in the subject catalogue on the research project: 16,6
* Most frequent trend of accessibility to detailed information in the subject catalogue: Constant - 73,7 % of the incidence group, i.e. 23,3 % of the target group.
* Average weighted index for the trend of limited access to information in the subject catalogue: 20,5.

On comparing the findings in the literature to those of the target group: The literature reports that 6,9 % of the respondents considered that the catalogue was never or rarely sufficiently indexed to permit retrieval, and that 78,4 % indicated that it was. In comparison, 31,7 % of the target group indicated that they did not always obtain detailed access and 20,0 % that they usually did. These figures are comparable and indicate that the extent of the barrier is thus higher in the target group.

For compiling the list of the barriers in sequence of seriousness at the end of this chapter, the seriousness of this barrier is summarized as follows:

Size of the barrier group for the barrier of inadequate subject indexing level (Category A)

Applying the formula s = f + e1 + e2 + t, the seriousness of the barrier of inadequate subject-indexing level, as measured against the subject catalogue, comes to: 31,7 + 19,6 + 16,6 + 20,5 = 88,4.

5.13 BARRIER OF GEOGRAPHIC DISTANCE

This barrier, identified in the literature and pertaining mainly to the 'excessive' geographic distance to the source of information, was briefly described in 2.1.18. The project limits the interpretation of geographical distance to information sources within the LIS of the own organization, and to the dispersal of information sources on the shelves of the LIS. Excluded from this barrier are the delays encountered with national or international interlending. Such delays are covered by the barrier of processing delays in 5.19.

The extent of the barrier of geographic distance is identified from the literature and from the target group.

5.13.1 The barrier of geographic distance as identified in the literature

As far as could be established, the literature does not provide any contribution on the extent of the barrier of geographic distance to information sources within the LIS of the own organization.

5.13.2 The seriousness of the barrier of geographic distance as identified by the target group (Q 13.3)

The extent of the barrier is determined by testing whether the information sources are disperses among different LIS and among different topics.

5.13.2.1 The distance to information sources among different LIS in the organization as a barrier (Q 13.3)

The respondents were asked whether their information sources were dispersed among different LIS in their organization, and if so, whether access was a barrier. To this question, 16 of the 60 respondents (26,7 %) indicated that their resources were dispersed. Of these 16, three (18,8 %) mentioned that access did not present a barrier whereas it did present a barrier to the remaining 13 (81,2 %) respondents. Expressed in terms of the target group, information sources dispersed among different LIS presented a barrier to 21,7 % of the respondents.

5.13.2.2 The dispersal of information sources among other disciplines on the shelves of the LIS as a barrier (Q 13.2)

To the question whether the information sources were dispersed among other subjects on the shelves, and if so, whether this was a barrier, 45 of the 60 respondents (75,0 %) replied that their information sources were dispersed. Of these 45 respondents, 28 respondents (62,2 %, i.e. 46,7 % of the target group) replied that this dispersal did not present a barrier whereas it did present a barrier to the other 17 respondents (37,8 %). Thus, expressed in terms of the target group, the dispersal of information sources among other disciplines on the shelves presented a barrier to 28,3 % of the respondents.

5.13.3 Summary of the barrier of geographic distance

As the literature does not report any contribution on geographic distance as a barrier, the summary reflects only the responses as collected from the target group:

* Percentage respondents whose information sources are dispersed among different LIS in the organization: 26,7.
* Respondents to whom the geographic distance to information sources among the different LIS in the organization is a barrier: 81,2 % of the incidence group, i.e. 21,7 % of the target group.
* Percentage respondents whose information sources are dispersed on the shelves: 75,0.
* Respondents to whom the dispersal of information on the shelves is a barrier: 37,8 % of the incidence group, i.e. 28,3 % of the target group.

Without an indication in the literature of the extent of this barrier no comparison to the extent of the barrier as indicated by the target group can be made.

For compiling the list of the barriers in sequence of seriousness at the end of this chapter, the seriousness of this barrier is summarized as follows:

Size of the barrier group for the barrier of geographic distance (Category B)

- **Distance to information sources among the different LIS: 21,7.**
- **Dispersal of information sources on the shelves: 28,3.**

5.14 BARRIER OF INFORMATION CONGESTION

This barrier, identified in the literature, was briefly described in 2.1.15 as an overload of information that could make access to published information more difficult and time-consuming.

The extent of the barrier is established from the contributions identified in the literature and as identified by the target group.

5.14.1 The barrier of information congestion as identified in the literature

The extent of the barrier is established by determining the growth of published information, the extent of the congestion of information, and the extent of the congestion of information barrier.

Several contributions in the literature illustrate the increase in knowledge:

- Bischoff (1967:7) estimated that the quantity of information doubled itself within ten years in the general sciences, within eight years in chemistry, five years in electronics and within three years in space research.
- In the study of scientific knowledge and manpower, the National Education Association of the United States of America estimated that our available knowledge doubled between the birth of Christ and 1750, doubled again between 1750 and 1900 in one hundred and fifty years, doubled from 1900 to 1950 in fifty years, from 1950 to 1960 in ten years and from 1960 to 1966 in six years (Study report on the feasibility...1971:11, quoted from the 1968 Information Technology Conference, San Juan, Porto Rico). Murgio (1969:199), Orr (1977:7), and Steinbuch (1970:72) quote similar statistics.

How these estimates were made could not be determined. Possibly they are based on the number of entries in abstract and index journals. In this regard, Vickery (1973:288) found that the entries in *Biological Abstracts* doubled every seven years, every 6,4 years in *Chemical Abstracts*, in *International Aerospace Abstracts* every four years, in *Index Medicus* every 4,7 years and in *Nuclear Science Abstracts* (now *INIS Atomindex*) every 6,1 years. Similarly, Ashworth (1974:63) demonstrates the growth rate of the number of abstracting and indexing services as well as the growth in size of these services. *Chemical Abstracts*, for example, published successive millions of abstracts from 1907 to 1938 within thirty eight years, then again within eighteen, eight, 4,75 years and its fifth millionth abstract 3,3 years later (i.e. around 1972). This rate is continuing, for correspondence with the compilers of *Chemical Abstracts* revealed that by the end of 1988 nearly twelve and a quarter million abstract were published. Online files containing eight and a half million documents provide access from 1967.

Other abstract and index journals, e.g. *Nuclear Science Abstracts* or *INIS Atomindex* also record substantive increases (Vaden, 1969:5; Cape, 1974:2; *INIS Circular Letter* number 74 of 10 April 1978, number 89 of 12 March 1980, number 100 of 19 January 1981). Other surveys outlining the increase in information and publications are found in Kruger (1964:1-7); King et al., (1976); Haag (1978:20-21).

Several authors maintain that the increase in information and in the number of publications outstrips the effective information handling capacity of both researchers and information systems, can result in increasing inaccessibility of information (Seidman, 1981:65), and that it constitutes a barrier to information transfer (Kruger, 1964:1-3; Allen, 1969:137; Steinbuch, 1970:73; Beinhauer & Schmacke, 1970:8; Vagianos, 1971:87; Bernier, 1978:445-448). Other authors, however, indicate that users of information have an inbuilt ability to handle large amounts of information, even though

this is then done selectively (Wilson, 1976; Rudd & Rudd, 1986a), and that "information overload" is likely to occur only rarely (Rudd & Rudd, 1986b).

Some authors, e.g. Frank (1961:12) and Bernier (1978:446) have tried to express the excessive extent of information in terms of time required to read the literature produced in a particular discipline. Bernier, for example, calculates that it would take more than twenty seven centuries to read the annual biomedical research literature at two papers a day, and more than seven centuries to read a year's chemical literature. These calculations, however, cannot indicate the extent of information congestion, as no researcher needs to read everything produced on a particular discipline.

In spite of the many articles dealing with the excessive extent of information, only three contributions indicate the extent of this barrier could be traced in the literature:

- Blaxter & Blaxter (1973:336), in their study of researchers of three biological research institutes in Aberdeen, established that 94 % of the respondents claimed no difficulty in keeping up to date with advances in their own field, and 39 % even thought that they could keep up to date with work within their disciplines.
- The findings of the Royal Society (Study of the scientific ..., 1981:6) serves as second example. On being asked whether there were too many journals in the respondents research field, from 48 % to 81 % of the respondents in the various organizations replied 'about enough', from 12 % to 46 % replied 'too many' and up to 6 % replied 'not enough'.
- In her comparative survey of 448 users and non-users of onsite industrial-commercial services, Slater (1984a:127,130) reports that 57 % of the sample, i.e. 253 respondents, said that there was too much literature to cope with. To 140 of the 253 respondents, i.e 55,3 %, excess information presented a problem; to 113 respondents, i.e. 44,7 % it did not.

5.14.2 The seriousness of the barrier of information congestion as identified by the target group

The extent of the barrier of information congestion is established by determining

- whether there is an excess of published information
- what is the effect of excess information on the acquisition of information
- what is the effect of excess information on the research project
- whether the extent of excesss information is decreasing, remaining constant, or is increasing.

5.14.2.1 The extent of excess published information (Q 10.1)

To the question whether there is an excess of published information, 31 of the 60 respondents (51,7 %) replied that there was and 29 respondents (48,3 %) replied that there was not.

5.14.2.2 The effect of excess published information on the acquisition of information and on the research project (Q 10.1.1)

The effect of excess published information on the acquisition of information and on the research project for the 31 respondents is outlined in Tables 38 and 39.

Table 38: Effects of excess published information on the acquisition of information

Type of effect	EXTENT OF THE EFFECTS ON THE ACQUISITION OF INFORMATION N=31	%	N=60	%
Delays the acquisition (2)	4	12,9	4	6,7
Increases effort (3)	24	77,4	24	40,0
Increases cost (4)	1	3,2	1	1,7
Eliminates accessibility/usability (5)	2	6,5	2	3,3
No excess experienced	-	-	29	48,3
TOTAL	31	100	60	100

The calculated weighted aggregative index for the effect of excess information on the acquisition of information: 31,3.

Table 39: Effects of excess published information on the research project

Type of effect	EXTENT OF THE EFFECTS ON THE RESEARCH PROJECT N=31	%	N=60	5
No effect (1)	2	6,5	2	3,3
Increases effort (2)	15	48,4	15	25,0
Increases cost (3)	1	3,2	1	1,7
Delays the project (4)	9	29,0	9	15,0
Decreases the quality (5)	4	12,9	4	6,7
No excess experienced	-	-	29	48,3
TOTAL	31	100	60	100

The calculated weighted aggregative index for the effect of excess information on the research project comes to 30,4.

5.14.2.3 The trend of excess published information (Q 10.1.2)

As for the trend of excess published information, 25 of the 31 respondents (80,6 %) mentioned that the extent of excess published information was increasing while 6 respondents (19,4 %) thought that the trend remained constant. No respondent registered a decreasing trend. Expressed in terms of the target group, this implies that 41,7 % of the respondents thought that the extent of excess published information was increasing, and 10,0 % that the trend was remaining constant. This is the first barrier up to now recording an increasing trend.

Weighting these latter responses with 3 for the increasing, and 2 for the constant trend responses, and dividing the product by 3, gives a calculated average weight for the trend of excess published information of 48,4.

5.14.3 Summary of the barrier of information congestion

This summary reflects the data as collected from the literature and from the target group:

The literature

* Respondents who think there are too many journals : 12,0 to 46,0 %.
* Respondents who think there is too much literature to cope with: 57,0 %.
* Respondents who find too much information a problem: 55,3 %.

The target group

* Percentage respondents who experience an excess of published information: 51,7.
* Most frequent effect of excess published information on the acquisition of information: Increases effort required - 77,4 % of the incidence group, i.e. 40,0 % of the target group.
* Average weighted index for the effect of excess publications on the acquisition of information: 31,3.
* Most frequent effect of excess published information on the research project: Increases effort required - 48,4 % of the incidence group, i.e. 25,0 % of the target group.
* Average weighted index for the effect of excess publications on the research project: 30,4.
* Most frequent trend of excess published information: Increasing - 80,6 % of the incidence group, i.e. 41,7 % of the target group.
* Average weighted index for the trend of excess publications: 48,4.

Comparing the findings from the literature to those of the target group, the following emerges:

- The literature reports that 12 % to 46 % of the respondents think that there are too many journals, and 57 % think that there is too much literature to cope with; 51,7 % of the target group experience an excess of published information.
- The questionnaire did not include a question as to whether the excess of published information constituted a barrier or not. For comparative reasoning however it can be surmised that an increase in cost and the elimination of accessibility, as indicated in Table 38, represents a barrier, and that thus 27 respondents of the target group (45,0 %) experienced this barrier. Assuming the same for Table 39 would create a barrier rate for 29 respondents of 48,3 %. In comparison, 55,3 % of the respondents in the literature found that too much information was a problem.

For both the extent of surplus publications and for the extent of the barrier, the figures from the literature and from the target group are therefore about equal.

For compiling the list of the barriers in sequence of seriousness at the end of this chapter, the seriousness of this barrier is summarized:

Size of the barrier group for the barrier of information congestion (Category A)

Applying the formula **s = f + e1 + e2 + t**, the seriousness of the barrier of information congestion comes to: **51,7 + 31,3 + 30,4 + 48,3 = 161,7.**

5.15 BARRIER OF IRRELEVANT INFORMATION

This barrier, identified from the literature, pertains to the supply of irrelevant information not related to the need, as described in 2.1.16.

The extent of this barrier is established by determining the extent of irrelevant information as identified in the literature and as identified by the target group.

5.15.1 The barrier of irrelevant information as identified in the literature

The literature reports only the contribution by Slater (1984a:72) who mentions that 12 % of her respondents urged for an evaluation, analysis and pre-digestion of information supplied. The literature does not indicate the extent of this barrier.

5.15.2 The seriousness of the barrier of irrelevant information as identified by the target group

To determine the extent of the barrier of irrelevant information, the target group was asked

- what percentage of the references supplied by the LIS are applicable;
- whether the use of reference service of the LIS was reduced because it provides too many irrelevant references.

5.15.2.1 Extent of applicable references supplied by the LIS (Q 14.3)

As indicated in Table 6 on page 58, thirty-four of the 60 respondents, i.e. 56,7 %, were not supplied with references. The responses of the remaining 26 respondents to the question as to the applicability of supplied references are expressed below in terms of the incidence group and the target group.

Table 40: Applicability of references provided by the LIS

	APPLICABILITY OF REFERENCES			
Applicability category	Number N=26	%	Number N=60	%
0 % (None applicable)	0	0,0	0	0,0
1-20	2	7,7	2	3,3
21-40	6	23,0	6	10,0
41-60	8	30,8	8	13,4
61-80	2	7,7	2	3,3
81-99	6	23,1	6	10,0
100 % (All applicable)	2	7,7	2	3,3
No references supplied	0	0,0	34	56,7
TOTAL	26	100	60	100

The highest response category (13,4 %) thus indicated that 41-60 % of the references supplied by the LIS to be applicable. The high percentage of respondents who were not supplied with references shows the reactive, rather than the preactive, role of the LIS.

In response to the question as to the percentage applicability of the self-generated references, the respondents, as can be expected, indicated a higher applicability rate. From 81-99 % of those references were found applicable by 46,6 % of the target group.

5.15.2.2 Reduction of LIS use because too many irrelevant references are supplied (Q 14.6)

In reply to the question whether the use of the LIS was reduced because too many irrelevant references were supplied, 75,0 % of the respondents indicated that they did not reduce the use, and 25,0 % that they did reduce the use of the LIS. Although it was not established whether the supply of too many irrelevant references presented a barrier or not, it may be assumed a reduction in the use of the LIS because of too many irrelevant does imply the presence of the barrier. Thus for the purpose of the project the extent of the barrier is established at 25,0 % of the target group.

5.15.3 Summary of the barrier of irrelevant information

The summary reflects the data as collected from the literature and from the target group:

The literature

* Respondents who urge an evaluation, analysis and pre-digestion of information supplied by the LIS: 12 %.

The target group

* Most frequent percentage applicability of references supplied by the LIS: 41-60 % applicability by 30,8 % of the incidence group, i.e. 13,4 % of the target group.
* Most frequent percentage applicability of self-supplied references: 81-99 % applicability by 46,6 % of the target group.
* Percentage respondents who reduce their use of the LIS because too many irrelevant references are supplied: 25,0.

As the literature and the questionnaire deal with different aspect of the same barrier, the data is not comparable.

For compiling the list of the barriers in sequence of seriousness at the end of this chapter, the seriousness of this barrier is summarized as:
Size of the barrier group for the barrier of irrelevant information (Category B): 25,0.

5.16 BARRIER OF UNRELIABLE REFERENCE TOOLS

Identified by researchers and briefly described in 2.2.8, this barrier pertains to lacking or deficient reference tools, unreliable reference tools to the holdings of publications in other LIS, spelling mistakes in databases, lacking key-words, lack of indexes and incomplete and poorly compiled indexes in books. Admittedly these aspects are not representative of the barrier. Many other aspects could have been dealt with, but had to be excluded because of the shortage of interview time.

The extent of the barrier is established from the extent of the above aspects as identified in the literature and by the target group.

5.16.1 The barrier of unreliable reference tools as identified in the literature

The literature offers a sparse indication of the extent this barrier.

5.16.1.1 Omission of indexes from conference proceedings

- On the inclusion of indexes in conference proceedings, Hanson & Janes (1960:65-66) found that of 205 publications, half had no index, over

half had no subject index, nearly 66 % had no author index, and only a quarter had both author and subject index.

- Mills (1973:39-40) established that of the 237 inspected proceedings that should have an index, 53 (22,4 %) had a subject index, 61 (25,7 %) an author index and 28 proceedings (11,8 %) had both a subject and author index.

5.16.1.2 Indexes in books

Surprisingly no contribution could be found in the literature outlining the extent of deficient indexes in books. The contribution by Bakewell (1979) however indicates the general deficiencies found in indexes in books.

5.16.1.3 Unreliable coverage

On ckecking the correctness of the statement of Ulrichs indicating the abstract and index coverage of journals, Wyndham (1980:155) found that Ulrich correctly listed 28 % of the abstracts or indexes that covered the journals.

5.16.2 The seriousness of the barrier of unreliable reference tools as identified by the target group

As this barrier covers many aspects (e.g. comprehensiveness, coverage, accuracy, currentness) and as it is not possible to test the extent of the barrier on all these aspects, the measuring is selective and includes only the following two aspects:

- Whether important keywords or terms are not included in abstract and index journals or SDI services or thesauri.
- Whether the following provide access to detailed information: abstract or index journals; abstracts of articles in journals; indexes in books; computerized data bases.

5.16.2.1 The extent to which important keywords/terms are not included in abstract and index journals (Q 10.5)

The 60 respondents were asked whether there were important keywords or terms used in their research which were not included in abstract and index journals or in SDI services or thesauri, and if so, whether this presented a barrier or not.

Forty two of the 60 respondents, i.e 70,0 %, replied that the important keywords or terms were included. To the remaining 18 respondents, the omission did not present a barrier to 4 respondents (22,2 %), whereas it did present a barrier to the remaining 14 of the 18 respondents (77,8 %). Expressed in terms of the target group, this implies that the absence of important keywords or terms did not present a barrier to 6,7 %, whereas it did present a barrier to 14 of the 60 respondents, i.e. 23,3 %.

5.16.2.2 The extent to which access to detailed information is provided (Q 10.7)

The 60 respondents were asked whether abstract or index journals, abstracts of articles in journals, indexes in books and computerized data bases provide access to detailed information, and if not, did this present a barrier.

The responses are processed in Table 41.

Table 41: Presence and extent of the barrier of access to detailed information

Index media	EXTENT OF ACCESS TO DETAILED INFORMATION AND EXTENT OF BARRIER					
	Do not know %	Sufficient access provided %	Insufficient access: Presents no barrier No.	%	Presents a barrier No.	%
Abstract or index journals	0,0	46,7	8	13,3	24	40,0
Abstracts of articles	0,0	50,0	8	13,3	22	36,7
Indexes in books	5,0	43,3	3	5,0	28	46,7
Data bases	25,0	41,7	5	8,3	15	25,0

Of the four aspects of the barrier tested, indexes in books presented the highest barrier (46,7 % of the target group). By adding the last two % figures in every row it can be seen that 53,3 % insufficient access was gained by the target group to abstract or index journals, 50,0 % to abstracts of articles, 51,7 % to indexes in books and 33,3 % to data bases. Expressing the barrier in terms of the incidence group, 75,0 % experienced the barrier with abstract or index journals, 73,3 % with abstracts of articles, 90,3 % with indexes in books and 75,0 % with data bases. Table 41 thus shows that the tools specifically created to promote access to published information also contain elements that obstruct such access.

5.16.3 Summary of the barrier of unreliable reference tools

The summary reflects the extent of the barrier as reported in the literature and as indicated by the target group:

The literature

* About half of the conference proceedings had no index, from about half to 77 % had no subject index, from about 66 % to 74 % had no author index, from about 12 % to 25 % had both author and subject index.

The target group

* Percentage respondents who come across important keywords not included in abstract or index journals: 30,0.
* Respondents to whom the omission of important keywords from abstracts or indexes is a barrier: 77,8 % of the incidence group, i.e. 23,3 % of the target group.
* Extent of insufficient access provided by:
  - data bases: 33,3 %
  - abstracts of articles: 50,0 %
  - indexes in books: 51,7 %
  - abstract or index journals: 53,3 %.
* Extent of barrier for:
  - abstract or index journals: 75,0 % of the incidence group, i.e. 40,0 % of the target group
  - abstracts of articles: 73,3 % of the incidence group, i.e. 36,7 % of the target group
  - indexes in books: 90,3 % of the incidence group, i.e. 46,7 % of the target group
  - data bases: 75,0 % of the incidence group, i.e. 25,0 % of the target group.

As the contributions from the literature relate to aspects of the barrier not tested with the target group, no comparison between the two is possible.

For compiling the list of the barriers in sequence of seriousness at the end of this chapter, the seriousness of this barrier is summarized as follows:

Size of the barrier group for the barrier of unreliable reference tools (Category B)

Omission of important keywords from abstracts or indexes: 23,3 %.

Insufficient access provided by

- **abstract or index journals: 40,0**
- **abstracts of articles: 36,7**
- **indexes in books: 46,7**
- **databases: 25,0.**

5.17 BARRIER OF INCOMPLETE COVERAGE BY ABSTRACT AND INDEX JOURNALS

This barrier, identified from personal experience as an additional barrier and pertaining to contributions in periodicals and monographs not being covered by abstract and index journals, was briefly described in 2.5.2.

The discussion of the barrier of incomplete coverage of abstract and index journals involves an overview of the extent of the barrier as identified in the literature and the extent of the barrier as identified by the target group.

5.17.1 The barrier of incomplete coverage by abstract and index journals as identified in the literature

The extent of the barrier in the literature is gathered from contributions on the extent of incomplete coverage by abstract and index journals, and the extent of the barrier.

Several contributions indicate the adequacy of coverage by secondary publications:

- Martyn (1967:46-47), extending a previous study by Martyn & Slater (1964), checked the entries from 20 bibliographies on specific subjects mainly in the natural sciences for inclusion in abstract and index journals. While there were considerable differences in the coverage between the dissiplines, 21 % of the references were not covered. There was no general reason why these references were not included and no evidence that they were of lower quality or irrelevant.
- Vagianos (1971:87) reports that about half of the useful articles in chemistry are not covered.
- On the coverage of patents in abstracts, the literature reports as follows: Oppenheim (1974:136-137), assessing the coverage of chemical patents by *Chemical Abstracts*, found the coverage weak for Japanese and Belgian patents. This confirms the findings of Kaye (1965:5-7) that the coverage of British, Belgian and French patents by *Chemical Abstracts* is inadequate. Freeman & Oppenheim (1978:89-93), assessing and comparing the coverage of patents by nine abstract journals, established that the coverage ranged from "very poor" (for *Analytical Abstracts*) to "very well" (for *Plastics Abstracts*).
- On the coverage of conference papers, Hanson & Janes (1961:145) report that nearly half of the 386 conference papers they tested were neither abstracted nor listed and indexed. Singleton (1975:141) mentions that of more than 300 conferences of relevance to physics held in 1973 in the

United Kingdom, only 50 will produce specific prodeedings covered in *Physics Abstracts*.

- On the coverage of reports by abstracting and indexing services, Gray & Rosenborg (1957:18) indicate that for the most part, reports are not covered by the standard abstracting and indexing services, while Stevenson (1980:79), more than twenty years later, states that the increased use of on-line facilities has brought home the limitations in coverage of non-periodical literature by some of the major abstracting and indexing services.
- The coverage of publications from the developing countries also appears to be inadequate. Inspecting the coverage of librarianship journals by five secondary services, Moore (1981:42-44) shows that, except for *Library and information science abstracts*, the coverage is rather inadequate. Indeed this abstract alone covers African periodicals on that subject (Buckley, 1983:119). Byrne (1983), investigating the coverage of 250 Australian journals by international databases, established coverage rates ranging from 29 % for chemistry to 71 % for physical science in the natural sciences, and from 15 % for the arts to 50 % for librarianship in the human sciences, the coverage of human sciences journals being more incomplete than that of the natural sciences. In his study on the needs and problems in the publishing of scientific articles in South Africa, Burger (1987:30) established that about 35 % of the 816 respondents are dissatisfied with the coverage of publications issued by the Buro for Scientific Publications in international abstract and index journals.

In spite of these many contributions, no reference whether or not the inadequate coverage presents a barrier or not, and the extent of the barrier, could be found in the literature.

5.17.2 The seriousness of the barrier of incomplete coverage by abstract and index journals as identified by the target group (Q 10.4)

To determine the extent of omission of important published research results from abstract and index journals, the respondents were asked whether they know of such results that were not included in abstract and index journals, and if so, whether the omission presented a barrier.

Of the 60 respondents, 42 (70,0 %) did not know and 18 (30,0 %) did know of important published research results not included. All the 18 affirmative respondents indicated that this non-inclusion presented a barrier. Thus the barrier was experienced by all the respondents who had experienced the non-coverage and by 30,0 % of the study sample. Considering that it is by chance that the omission of important published research results from abstract and index journals are noticed, the extent of non-inclusion could be higher than the recorded 30, %.

5.17.3 Summary of the barrier of incomplete coverage by abstract and index journals

The summary is compiled from the extent as reported in the literature and as indicated by the target group:

The literature

* Range of material not included in abstract and index journals: From 21 % to 50 %, with comments on coverage ranging from "very poor" to "very well".
* Percentage respondents dissatisfied with coverage: 35.

The target group

* Percentage respondents who know of important published research results not included in abstract and index journals: 30,0.
* Respondents to whom this non-inclusion presents a barrier:100 % of the incidence group, i.e. 30,0 % of the target group.

From the listed figures only a rough comparison between the two sources of data can be made. The 21-50 % from the literature may be compared to the 30,0 % of the target group knowing of important published research results not included in abstract and index journals. The respondents of the literature dissatisfied with coverage (35 %) can be roughly compared to the 30,0 % of the target group who find non-inclusion a barrier. Thus the extent of the barrier in the two sources is about equal.

For compiling the list of the barriers in sequence of seriousness at the end of this chapter, the seriousness of this barrier is summarized as:
Seriousness of the barrier of incomplete coverage by abstract and index journals (Category B): 30,0.

5.18 BARRIER OF INFORMATION PUBLISHED IN OBSCURE PUBLICATIONS

This barrier, identified from personal experience and pertaining to the unexpected retrieval of information from publications not usually used for publishing the contributions of a particular discipline, was briefly described in 2.5.1.

The extent of this barrier can be determined from the extent as identified in the literature, and as identified by the target group.

5.18.1 The barrier of information published in obscure publications as identified in the literature

Two contributions describing the extent of information published in obscure publications could be traced in the literature:

- In the survey of Martyn (1964a:13), about 12 % of the instances of late finds of relevant references were due to the information being published in an 'unexpected place'. The figure for the repeat survey of 1985/86 was 16 % (Martyn, 1987:17).
- Investigating the role of national meetings in information communication, Garvey et al. (1972:163) established that while most of the published presentations seemed channeled into the 36 core journals (about 62 % of the 835 articles), the remaining 317 articles (about 38 %) were scattered in 189 noncore journals. The implication on information retrieval are obvious, for while the respondents knew of about 80 % of the articles in core journals, they knew of only about 44 % of the articles in the noncore journals.

No contributions on the extent of the barrier of information published in obscure publications could be traced in the literature.

5.18.2 The seriousness of the barrier of information published in obscure publications as identified by the target group (Q 10.10)

To test the extent of this barrier, the respondents were asked whether relevant research results are published in obscure or unexpected publications and if so, whether this presented a barrier or not.

Of the 60 respondents, 25 (41,7 %) responded that they had not come across relevant research results published in obscure or unexpected publications and 35 respondents (58,3 %) replied that they had. Of the latter group, the publishing in obscure publications did not presented a barrier to 11 respondents, i.e. 31,4 % of the barrier group and 18,3 % of the target group, while it did present a barrier to 24 respondents (68,6 %). Thus this barrier was experienced by 40,0 % of the target group.

5.18.3 Summary of the barrier of information published in obscure publications

The summary is compiled from the contributions to the literature and from the data collected from the target group:

The literature

* Respondents who found relevant information later than when required because it was published in a obscure publication: 12 %.
* Percentage respondents who knew of articles in core journals as against respondents who knew of articles in obscure publications: 80 % as against 44 %.

The target group

* Percentage respondents who come across relevant research results published in obscure publications: 58,3.
* Respondents to whom the publishing of relevant research results in obscure publications presents a barrier: 68,6 % of the incidence group, i.e. 40,0 % of the target group.

The figures reported in the literature cannot be compared to those collected from the target group. The former indicates only part of the extent (only the relevant information found too late), whereas the latter indicates all incidences of information published in obscure sources. Assuming that the finding of information in obscure publications too late to still be useful does constitute a barrier, the 12 % from the literature may be compared to the percentage of the target group (40,0 %) considering the publishing of information in obscure publications a barrier. The extent of the barrier is thus more pronounced in the target group.

For compiling the list of the barriers in sequence of seriousness at the end of this chapter, the seriousness of this barrier is summarized as follows:

Seriousness of the barrier of information published in obscure publications (Category B): 40,0.

5.19 BARRIER OF PROCESSING DELAYS

The barrier of processing delays, identified by researchers and briefly described in 2.2.9, pertains to excessive delays in placing orders, executing orders, cataloguing, binding, supplying requested information and interloans.

The extent of the barrier is determined from the extent as identified in the literature and as identified by the target group.

5.19.1 The barrier of processing delays as identified in the literature

The extent of the barrier is gathered from the literature through the processing times and delays for new orders, cataloguing, binding and for interloans, and from the reported extent of the barrier.

5.19.1.1 Processing times and delays

The literature provides several indications on the processing time and delays:

Orders for new publications

- Leonard, Maier & Dougherty (1969:32) reveal the extent of the considerable variation in processing times in nine academic libraries with processing lags ranging from 65 days to 374 days, with an arithmetic mean of 189 days.
- Law (1980:462-463) in his Edinburgh University library survey, calculated the time required for placing and for executing orders for new publications. Half the British published books ordered were supplied to the library within six weeks and about three quarters arrived within three months, with increased lags for orders from foreign countries.

Cataloguing

- Law (1980:463) states that the median book takes less than one week to accession, two weeks to be catalogued, bookplated and prepared for shelving and two more weeks to appear in the catalogue. This figure however seem very optimistic and does not appear to reflect the impressions gained from experience.
- On the extent of cataloguing backlogs, the literature offers the following contributions: The 1968 survey of 91 university libraries belonging to the Association of Research Libraries, 67 of the 86 responding libraries (77,9 %) indicated that they had backlogs, and three-fifths expected the backlogs to continue and increase (Piternick, 1969:109). In the 1984 survey, 68 of the 88 respondents who returned the questionnaire, i.e. 77 %, indicated that they had backlogs (Agnew, Landram & Richards (1985:345). In most libraries the backlog had existed for a long period - for about 76 % of the respondents it had existed for more than ten years, and for only about 3 % had a backlog arisen within the preceding year.

Binding

- Hanson (1959:238) investigating the binding time for periodicals in 42 special libraries established a binding range of up to four months, with an arithmetic average of 69 days and an median of 65 days. This does not include the preparation before and verification after dispatch.

Interloans

- For South African interloans, Lor (1987:104) calculates that for the period March 1985 to February 1986, 7,1 % of the requests were filled or responded to after the first week, this increasing to 77,3 % at the end of the second week. Mean turnabout times was 11,9 days, with a median of 10 days and a mode of 7 days. The mean supply times for requests, which includes the re-submission of unsuccessful requests, was 33,5 days, with a median of 22,5 and a mode of 14 days.
- White (1986:28-30) indicates that about 32 % of the national interloans in Britain were supplied within seven days, and 67 % within 14 days.
- In the U.S.A., Miller & Tegler (1988:358) indicate that 70 % of the network supplied documents arrived within eight days, the average turnaround time being 9,8 days (median time, 12,5 days). Database-specific suppliers filled 52 % of the requests within 8 days, with an average of 12,8 days (median time, 14,5 days).

These processing times and delays serve to show their varying extent, and cannot have general validity.

5.19.1.2 The extent of the barrier of processing delays

Only some contributions in the literature indicate whether and to what extent these processing delays interfered with the acquisition of information or presented a barrier:

Orders for publications and cataloguing

As it is difficult for respondents or library users to distinguish between processing delays for orders and cataloguing, the extent of these delays and barriers are grouped together:

- In the Leonard, Maier & Dougherty (1969:229) study, 30 % of the respondents indicated that new books were never or rarely available at the time when needed, while 45 % noted that they were sometimes available.
- In the user survey at the libraries of the University of the Witwatersrand (1971a:2), the academic staff rated the delay in ordering and processing of new publications as the most serious barrier experienced.

Binding

- Buckland et al. (1970:32) found that 6 out of 132 failures (4,5 %) to get publications were due to binding.
- In the user survey at the University of the Witwatersrand (1971a:2) binding delays as a barrier were ranked in twelth position by the academic users.
- In the unavailability study of periodicals at the University of British Columbia Library System, 3 of 200 requested periodicals (1,5 %) in the 1983 survey, and 58 of 200 periodicals (29,0 %) of the 1984 survey, were not immediately available because of binding procedures (Watson, 1984:498).
- The statistical analysis of interloans for 1985 at the HSRC indicated that of the 890 requests received from other libraries that could not be provided, 41 (i.e. 4,6 %) could not be provided because they were at the binders (Miller & Gouws, 1986:8).

Interloans

- In the Leonard, Maier & Dougherty (1969:231) survey, 40 % of the users at the universities and 31 % of the users at the colleges rated interlending as too slow. The average loan period cycle ranged from three to five weeks.
- The survey at the University of the Witwatersrand (1971a:2) established that interlending delays were the fourth most frequently mentioned barrier.
- Neubauer (1974:129), in his analyses of 6 000 library users at six universities, established that for nearly half of the interloan users the requested publications did either not arrive or arrived too late.
- Lehmann (1976:1) mentions that a 1973 user survey at six university libraries in the Federal Republic of Germany revealed that half of the respondents indicated that the required publication arrived too late for its intended purpose.
- Two contributions determine the effects of interlending delays from the British Library: Houghton & Prosser (1974:357) found that 4,8 % of the respondents experienced a hold-up while awaiting the arrival of interloans, while a further 5,2 % were partly inconvenienced - thus about 10 % were partly inconvenienced. The study by Barr & Farmer (1977:9) mentions that 16,3 % of their respondents were inconvenienced. Interestingly, they found that an increase in the delay period did not cause greater inconvenience, the important factor being the knowledge whether the required periodical was available or not. Although the extent of the inconvenience is not indicated in these two studies, the re-

sults show that the delay factor is less significant than assumed and that inconvenience is minimal.

5.19.2 The seriousness of the barrier of processing delays as identified by the target group (Q 15;17.4)

The extent of the delays was determined on the following processes:

- new monographs on order
- new journals on order
- requests for reference information
- requests for publications from own LIS, other LIS in the RSA and from overseas
- delays in binding journals.

As it is difficult (if not impossible) for researchers to distinguish between delays in placing orders, executing orders and the delays in cataloguing, the extent of these combined delays are tested as delays in new monographs and new journals respectively.

The extent of the delays was determined by asking the respondents

- how frequently the first four of the above mentioned processes (new monographs on order, new journals on order, requests for reference information and for interloans) are available on time;
- what the effect of the delay is on the acquisition of information and on the research project;
- what the trend of the delay is.

The delay for binding journals was tested only for presence of delay and whether the delay presented a barrier.

5.19.2.1 Timely availability of new monographs, new journals, quick reference information, publications and interloans within the expected time

The responses on timely availability and delays are outlined in Table 42.

Table 42: Timely availability of services according to availability (%)

% availability	TYPE OF PROCESS OR SERVICE: New monographs	New Journals	Refer. information	Publications from own LIS	RSA LIS	overseas LIS
never (7)	15,0	6,7	3,3	3,3	6,7	6,7
1-20 % (6)	11,7	6,7	0,0	0,0	6,7	0,0
21-40 % (5)	11,7	3,3	1,7	5,0	3,3	3,3
41-60 % (4)	13,3	0,0	0,0	3,3	13,3	6,7
61-80 % (3)	8,3	0,0	5,0	13,3	18,3	13,3
81-99 % (2)	11,7	10,0	43,3	46,7	33,3	23,4
Subtotal	71,7	26,7	53,3	71,6	81,6	53,4
100 % (1)	13,3	3,3	11,7	13,4	8,4	3,3
Subtotal	85,0	30,0	65,0	85,0	90,0	56,7
Do not request/ do not know	15,0	70,0	35,0	15,0	10,0	43,3

(Column totals = 100)

Looking at the most frequent response of each colums, 15 % of the respondents indicate that monographs are always late, journals are always on time as is reference information supplied, publication from the own LIS, and interloans. The figures for overseas interloans however must be seen in context to the high (43,3 %) 'do not request/do not know' figure for overseas interloans. From experience it is known that researchers are reluctant to use overseas interloans because of delays and charges. Many prefer to phone their overseas colleagues for such service. Thus the satisfaction rate for overseas interloans should not be as high as recorded.

The weighted aggregative index is calculated for each category by using the weights indicated in brackets. The weights, to express a barrier and not availability, are reversed and come to:
New monographs: 49,8.
New journals: 18,1.
Reference information: 20,7.
Publications from
- own LIS: 29,7.
- other LIS in the RSA: 41,0.
- overseas LIS: 25,7

5.19.2.2 The effect of a delay in the receipt of a publication or information on the acquisition of information and on the research project (Q 15.3)

The effects were not tested individually for each publication or service category (e.g. monographs, journals, reference information, publications or interloans), but were tested together.

The responses to the question as to the effect of a delay in the receipt of a publication or information on the acquisition of information for research are presented in Table 43.

Table 43: Type and extent of effect of a delay in the receipt of a publication or information on the acquisition of information

Type of effect	EXTENT OF EFFECT Number	%
Delays the acquisition (2)	8	13,3
Increases effort required (3)	27	45,0
Increases cost (4)	2	3,3
Eliminates accessibility/usability (5)	20	33,4
Do not know/did not use service (0)	3	5,0
TOTAL	60	100

The most frequent effect of the delay on the acquisition of information is thus an increase in required effort (45,0 % of the respondents). If calculated in terms of the incidence group, i.e. 57 respondents, this percentage comes to 47,4 %. The calculated average weight index for the effect of the delay in the receipt of a document or information on the acquisition of information comes to 68,4.

The responses of the 60 respondents to the question as to the effect of a delay in the receipt of a publication or information on the research project are reflected in Table 44.

Table 44: Type and extent of effect of a delay in the receipt of a publication or information on the research project

Type of effect	EXTENT OF EFFECT Number	%
No effect (1)	1	1,7
Increases effort required (2)	17	28,3
Increases cost (3)	4	6,7
Delays the project (4)	18	30,0
Decreases the quality (5)	17	28,3
Do not know/did not use service (0)	3	5,0
TOTAL	60	100

The most frequent effect of the delay on the research project is thus a delay in the project (30,0 % of the respondents). If calculated in terms of the incidence group, i.e. 57 respondents, this percentage comes to 31,6 %. The calculated average weight index for the effect of the delay in the receipt of a document or information on the research project comes to 68,0.

5.19.2.3 The trend of the delay in obtaining publications or information from the LIS

The trend was measured for each type of publications or service, i.e. new monographs, new journals, requests for reference information, requests for publications from the own LIS, from other LIS in the RSA and from overseas LIS. The responses to the question whether the extent of the delays in obtaining the above-mentioned services was decreasing, remaining constant or increasing is outlined in Table 45.

Table 45: Trend of the delay in obtaining publications or information by category of service and by type of delay

Type of service	TREND OF THE DELAY Do not use %	Decreasing %	Constant %	Increasing %
New monographs	28,3	1,7	65,0	5,0
New journals	73,3	0,0	26,7	0,0
Reference information	46,7	0,0	53,3	0,0
Publications from:				
. own LIS	28,3	0,0	71,7	0,0
. other LIS in the RSA	18,3	1,7	80,0	0,0
. overseas LIS	46,7	0,0	53,3	0,0

(Row totals = 100)

The most frequent trend is thus constant for all types of services. By weighting the decreasing responses by 1, the constant responses by 2, and the increasing responses by 3, and by dividing the product by 3, the weighted aggregative index for each type of service comes to:
new monographs: 48,9;
new journals: 17,8;
reference information: 35,5;

publications from
- own LIS: 47,8;
- other LIS in the RSA: 53,3;
- overseas LIS: 35,5.

5.19.2.4 Processing delays with the binding of journals (Q 17.4)

The processing delays with the binding of journals was tested separately and by a simpler method, the 60 respondends being asked whether some of the journals were at the binders when they needed them, and if so, whether this was a barrier or not.

Of the 60 respondents, 42 (70,0 %) replied that of the requested journals were at the binders when they requested them. To 31 of the 42 respondents (73,8 %) this presented a barrier whereas it did not present a barrier to the other 11 respondents, i.e. 18,3 % of the target group. Expressed in terms of the target group, this implies that 51,7 % of the target group experienced delays in binding procedures as a barrier.

5.19.3 Summary of the barrier of processing delays

The extent of the barrier is compiled from the contributions as reflected in the literature and as collected from the target group:

The literature

* Respondents for whom new books are available when needed: 30 % never or rarely, 45 % sometimes.
* Seriousness rating processing delays of new books: most serious.
* Respondents inconvenienced by interloan delays: 10 % to 16 %.
* Respondents for whom interloans do not arrive or arrive too late: From 31 % to 50 %.
* Failures caused by binding: From 1,5 % to 29,0 %.

The target group

* Most frequently mentioned availability within the expected time or most frequent unavailability of
  - new monographs on order: Always not available - 15,0 % of respondents and rarely available (1-20 %)- 11,7 % of the respondents.
  - new periodicals on order: 81-99 % available - 10,0 % of respondents.
  - reference information: 81-99 % availability - 43,3 % of respondents.
  - publications from own LIS: 81-99 % availability - 46,7 % of respondents.
  - publications from other LIS in the RSA: 81-99 % availability - 33,3 % of respondents.
  - publications from overseas LIS: 81-99 % availability - 23,4 % of respondents.
* Timely availability of
  - New monographs: 49,8.
  - New journals: 18,1.
  - Refernece information: 20,7.
  - Publications from
    - own LIS: 29,7.
    - other LIS in the RSA: 41,0.
    - overseas LIS: 25,7
* Most frequent effect of delay in obtaining publications or information on the acquisition of information: Increases effort required - 47,4 % of the incidence group, i.e. 45,0 % of the target group.
* Average weighted index for effect of delay in obtaining publications or information on the acquisition of information: 68,4.

* Most frequent effect of delay in obtaining publications or information on the research project: Delays the project - 31,6 % of the incidence group, i.e. 30,0 % of the target group.
* Average weighted index for effect of delay in obtaining publications or information on the research project: 68,0.
* Most frequent trend of delays for all types of publications and services: Constant.
* Average weighted index for the trend:
  new monographs: 48,9
  new journals: 17,8
  reference information: 35,5
  publications from
  - own LIS: 47,8
  - other LIS in the RSA: 53,3
  - overseas LIS: 35,5.
* Unavailability of some of the requested journals because they were at the binders: 70,0 %.
* Respondents who experience a barrier due to delays in the binding of journals: 73,8 % of the incidence group, i.e. 51,7 % of the target group.

The following comparison can be made between the data collected from the literature and from the target: Availability of new books: 30 % never or rarely availability in the literature as compared to 26,7 % by the target group (15,0 % + 11,7 %).

Seriousness of the barrier of processing delays (Category A)
By applying the formula s = f + e1 + e2 + t, the seriousness of processing delay for the six types of services is established as:
new monographs: 49,8 + 68,4 + 68,0 + 48,9 = 235,1
new journals: 18,1 + 68,4 + 68,0 + 17,8 = 172,3
reference information: 20,7 + 68,4 + 68,0 + 35,5 = 192,6
publications from
- own LIS: 29,7 + 68,4 + 68,0 + 47,8 = 213,9
- other LIS in the RSA: 41,0 + 68,4 + 68,0 + 53,3 = 230,7
- overseas LIS: 25,7 + 68,4 + 68,0 + 35,5 = 197,6.

For compiling the list of the barriers in sequence of seriousness at the end of this chapter, the seriousness of this barrier is summarized as follows:
Seriousness of the barrier of processing delays (Category B): Binding: 51,7.

5.20 POOR STRATEGY FOR INFORMATION SEARCHING BARRIER

This barrier, identified in the literature, was described in 2.1.26 (ignorance of information sources and services); 2.1.27 (unawareness of existing information barrier) and in 2.1.28 (suspected existence of information barrier).

The extent of the barrier is determined from contributions to the literature and from the extent of the barrier as identified by the target group.

5.20.1 The poor strategy for information searching barrier as identified in the literature

The extent of the barrier is established from the extent of poor strategy for information searching, and the extent of the barrier this causes.

The extent of poor strategy for information searching is evident in the following contributions over the last twenty-five years:

- Slater & Fisher (1969:13,57) established that only 3 % of the 6 300 scientists surveyed thought that a visit to the library was part of their systematic literature search.
- Aslib established that 40 % of the 600 researchers surveyed indicated that twelve publications, and a further 40 % thought that six publications were enough publications to start a major research project (Hanson, 1964:68).
- Studies in South Africa reveal the ignorance of existing reference tools (Schoeman & Reyneke, 1972:10,11; Nasionale Biblioteekadviesraad, 1974a:2; 1974b:2).
- Measuring reader failure at the shelf in three British universities, Urquhart & Schofield (1972:237) report a failure rate from 32,0 % to 48,7 %.
- Of the postgraduates surveyed at Hamburg University, 27 % did not know of the subject catalogue and another 27 % knew of it but did not use it. Another 37 % hardly used it and 10 % used it sometimes (Schoch, 1972:89).
- On the low use of patents as a source of information, Mornet (1972:104) established that slightly more than half of his respondents never used patents while Steyn (1984:114-115) established that only about 10 % of his respondents used them.
- Measuring reader failure rate at the catalogues of four British universities, Seymour & Schofield (1973:11,17) revealed a failure rate ranging from 25 % to 36 %.
- Evaluating a library's stock effectiveness, Schofield, Cooper & Waters (1975:217) established that 12 % of the failures not to get the required material was due to user error.
- Only a small proportion of scientists are aware of the most useful translation guides (Wood, 1967:125; Hutchins, Pargeter & Saunders, 1971a:19; Ellen, 1979:37; Loeben & Runge, 1985:132).
- The awareness of services offered by the LIS is low, e.g. of offered translation services (Stuart & Walker, 1970:57), while Nelson (1973:269) mentions that the faculty members of six colleges were aware of barely half the available services.
- Quantifying the causes of users' failures to identify and locate library materials in an academic college, Saracevic et al., (1977:16-17) establish that about a fifth of the failures were due to user error. In a similar study, Ciliberti et al., (1987:522) established that more than one third of the search failures were due to errors committed by the users. Of these, 60 % did not use the card catalogue correctly or failed to interpret its contents accurately. An additional 32 % could not locate the publication on the shelf, and 8 % of the failures were due to erroneous bibliographic information.
- Van Dalsen (1986:235) mentions that only slightly more than half of his respondents knew of computerized information services.

Although these contributions do to a certain extent reveal the extent of the barrier, no contributions could be traced which determine the extent of the poor strategy for information searching barrier. Only the contribution by Urquhart & Schofield (1972:239) shows the effect of the failure to trace required material at three university libraries, the failure being due to many reasons, not only weak information searching strategy. Looking at one of the responses, nearly 37 % considered the effect of the failure as either vital, serious or important, while to nearly 18 % there was no effect, 17 % did not reply, and interestingly, nearly 29 % considered the effect as a useful delay. Also interesting is their analysis confirming personal experience that the failure rate seems to decrease with seniority, i.e. the

failure rate for academic staff is lower than for postgraduates, which again is lower than that for undergraduates.

5.20.2 The seriousness of the poor strategy for information searching barrier as identified by the target group

As seen in 5.20.1, the extent of the barrier is made up of many different aspects that hamper the optimum identification and use of published information.

Determining the seriousness of this barrier by asking the respondent to evaluate himself can lead to useless data, for during the pilot study it emerged that evidently all the respondents were of the opinion that they were familiar with all the LIS facilities and services, which of course they were not. The formula of the alternative method can thus not be applied and the seriousness of the barriers is determined from only the following aspects pertaining or related to this barrier:

- If the numbering system for arranging publications on the shelves is difficult to use.
- Extent to which the LIS is kept fully informed of information needs.
- Awareness of the facilities and services of the LIS.

Furthermore, the extent of the barrier could be substantiated by certain responses to questions pertaining to other barriers, e.g.

- A high negative response to the question whether interdisciplinary study is necessary.
- A low use or non-use of certain LIS information sources, e.g. subject catalogue, journals, abstract or index journals, subject specialists.
- The preference not to select publications in a foreign language.

The analyses of these aspects follow:

5.20.2.1 Difficulties experienced with the numbering system for arranging publications on the shelves (Q 13.1)

In response to the question whether the numbering system was difficult to use, and if so, was this a barrier, 52 respondents (86,7 %) indicated that it was not, and the eight remaining respondents (13,3 %) that it was difficult to use. Of these eight respondents, seven (87,5 %) mentioned that the numbering system did present a barrier and one respondent that it did not.

Thus 11,7 % of the target group experienced difficulties in using the numbering system for arranging publications on the shelves.

5.20.2.2 Extent to which the LIS is kept fully informed of information needs (Q 14.7)

In response to the question whether the respondent kept the LIS fully informed of his information needs, 17 respondents (28,3 %) replied in the affirmative and the remaining 43 respondents (71,7 %) in the negative.

5.20.2.3 Awareness of LIS facilities and services (Q 20)

With only one or two instances, the respondents were of the opinion that they were aware of the services provided by their LIS. As the services were not individually named, the responses cannot be reliable. However, in 5.12.2.1 it was indicated that one respondent was not aware of the subject catalogue and another did not know how to use it.

5.20.2.4 The necessity for interdisciplinary study (Q 2.1)

In response to the question whether interdisciplinary study was necessary, 56 respondents (93,3 %) replied that it was, and four respondents (6,7 %) that it was not. This finding corresponds to the 89,2 % of Meijer (1980:71) and the 87,1 % of Burger (1984:23).

5.20.2.5 Low use or non-use of LIS information sources (Q 5.2)

The responses to the intensity of use of the subject catalogue, journals on display or circulated, abstract and index journals, and subject specialists, was outlined in Table 5 on page 57.

- The subject catalogue was used by 33,3 % of the respondents during the last month, but never used by 51,7 % of the respondents and not used during the last year or longer by 8,4 % of the respondents.
- Journals on display were used by 48,3 % of the respondents during the last month, but were never used by 41,7 % of the respondents.
- Journals on circulation were used by 68,5 % of the respondents during the last month, but were never used by 28,1 % of the respondents.
- Abstracts or index journals were used by 41,7 % of the respondents during the last month, but were never used by 28,3 % of the respondents and were not used during the last year or longer by 15,0 % of the respondents.
- Subject specialists were consulted during the last month by 63,3 % of the respondents. They were never consulted by 38,1 % of the respondents and were not consulted during the last year or longer by a further 4,8 % of the respondents.

5.20.2.6 The preference not to select publications in a foreign language (Q7.3)

It can be understood that researchers (and LIS personnel) will be reluctant to order publications in a language they cannot read. Of the 60 respondents, 47 i.e. 78,3 % indicated that they preferred not to order such publications, whereas 13 respondents, i.e. 21,7 % of the respondents ordered foreign language publications irrespective of whether or not they could read the language concerned. Related and also significant was the response to the question whether there were gaps in the LIS collection of foreign language publications (question 7.4.1 of the questionnaire). Of the 60 respondents, 31 i.e. 51,7 % did not know whether there were such gaps in the LIS or not (Table 19).

5.20.3 Summary of the poor strategy for information searching barrier

The literature

* Awareness of available services: 50 %.
* Ignorance of subject catalogue: 27 %.
* Non-use of subject catalogue: 27 %.
* Reader failure to get publications or to trace references: 12,0 % to 48,7 %.

The target group

* Percentage respondents who have a difficulty with numbering system used for arranging publications on the shelves of the LIS: 13,3.
* Respondents who find the numbering system a barrier: 87,5 % of the incidence group, i.e. 11,7 % of the target group.
* Respondents who do not keep the LIS fully informed of their information needs: 71,7 % of the target group.

* Respondents who never used the subject catalogue: 51,7 %, or last used it during the last year or longer than a year ago: 8,4 %.
* Respondents who never used journals on display: 41,7 %.
* Respondents who do not use journals on circulation: 28,1 %.
* Respondents who never use abstract or index journals: 28,3 %, and not used during the last year or longer be a further 15,0 %.
* Respondents who do not consult subject specialists: 38,1 %, and who have not consulted them during the last year or longer by a further 4,8 %.
* Respondents who do not select new publications written in a language they cannot read: 78,3 %.
* Awareness of gaps in foreign language publications in the LIS: 51,7 % indicated 'do not know'.

The two sets of figures allow only limited comparison between the extent of the barrier as identified from the literature and as recorded from the target group:
Ignorance of the subject catalogue: Literature 27 %, target group 1,6 %
Non-use of the subject catalogue: Literature 27 %, target group 51,7 %.

With so many different aspects, it is difficult to compile the seriousness of this barrier for compiling the list of barriers in sequence of seriousness. As it would be unfair to select one typical aspect of this barier to represent all the other aspects, it was decided to take the average reading of the aspects listed above (13,3 + 11,7 + 71,7 + 51,7 + 41,7 + 28,1 + 28,3 + 38, 1 + 78,3 + 51,7 = 414,46 divided by 10 = 41,5). Thus for compiling the list of the barriers in sequence of seriousness at the end of this chapter, the seriousness of this barrier is summarized as follows:
The seriousness of the poor strategy for information searching barrier (Category B): 41,5.

5.21 BARRIER OF UNNECESSARY DUPLICATION OF RESEARCH

This barrier, pertaining to the unnecessary duplication and replication of research, was identified in the literature and briefly described in 2.1.31.

The data leading to the discussion on the extent of the barrier are compiled from the extent of the barrier as identified in the literature, and as identified by the target group.

5.21.1 The barrier of unnecessary duplication of research as identified in the literature

From the literature the extent of unnecessary duplication of research, and the extent of the barrier of unnecessary duplication of research is determined.

The extent of unnecessary duplication of research emerges from the following contributions to the literature:
- Martyn (1964a:10-11) in his survey on literature searching by research scientists in industrial, academic and government research, reports that 43 of 245 instances of late discovery of relevant information (i.e. 17,6 %) unintentionally duplicated other work. In the repeat survey of 1985/86 the incidence of duplication was reported as 9 % (Martyn, 1987:19). In another contribution, Martyn (1964b:338) estimates that at least 0,9 % of the 1962 research expenditure in Britain was wasted because of some overlap between work in progress and work already completed.

- The survey conducted by the Advisory Council on Scientific Policy (1965:96) on information needs of physicists and chemists in Great Britain showed that 17 % of the research and development sample discovered unintentional duplication of research.
- Kuroda (1968:4-14), analysing the replies from nearly 3 000 physicists and chemists, shows that more than half of them experienced research duplication due to the lack of appropriate information.
- Line (1968:153) guesses that 50 % of the ideas published in librarianship have been published before.
- Masson (1970:35) in his *Cycle of knowledge*, indicates that 17,5 % of the South African researchers indicated that they had discovered, after completing their research, that someone else had already discovered and published substantially the same facts.
- Lubans (1971:363) reports that 26 % of the nearly 3 000 scientists surveyed met an obstacle or delay in their research which they could have avoided if the relevant results of current or past research had been known to them.

While these contributions illustrate the extent of unnecessary duplication of research, the literature does not indicate the extent of the barrier in more detail.

5.21.2 The extent of the barrier of unnecessary duplication of research as identified by the target group

This barrier is different to the other barriers measured. It is the product of other barriers, e.g. the barrier of poor strategy for information searching and its extent can be indicated simply be recording its frequency. Thus to test the extent of this barrier, the respondents were asked whether or not they had unintentionally duplicated, in part or whole, research already performed.

Twelve of the 60 respondents, i.e. 20,0 %, indicated that they had, and 48 respondents (80,0 %) indicated that they had not unintentionally duplicated research already performed.

5.21.3 Summary of the barrier of unnecessary duplication of research

The literature
* Percentage of unintentional duplication of research: 17 % to 50 %.

The target group
* Extent of unnecessary duplication of research: 20,0 %.

On comparing the extent of duplication as reported in the literature to that indicated by the target group, it appears that Masson (1970:57), in his study on scientific communication, was correct with his statement that South African researchers are probably no more likely to duplicate research than scientists abroad. It must appear as perturbing that the extent of unnecessary duplication of research as indicated by Masson nearly twenty years ago still persists.

For compiling the list of the barriers in sequence of seriousness at the end of this chapter, the seriousness of this barrier is summarized as follows:
The seriousness of the barrier of unnecessary duplication of research (Category B): 20,0.

5.22 BARRIER OF UNSUITABLE PERSONNEL

This barrier, briefly described in 2.2.13, was identified by the following three comments made by researchers:

- Staff lack awareness of developments in the subject.
- Staff do not take an interest in the department which they serve.
- Staff do not know how to use reference tools.

In addition, the following additional aspects, identified from personal experience, are relevant to the project:

- Extent to which interviews are conducted to establish information needs.
- Capacity of LIS personnel to select new publications.
- Capacity of LIS personnel to initiate references to published information.

The extent of this barrier is compiled from the extent as identified in the literature and as identified by the target group.

5.22.1 The barrier of unsuitable personnel as identified in the literature

From the literature only details on the presence of unsuitable personnel, but no references to unsuitable personnel as a barrier could be identified.

As this barrier is wider than the mentioned six aspects, any additional aspects as mentioned in the literature are also included in this overview to reflect the extent of unsuitable personnel and the extent of the barrier of unsuitable personnel:

- In their study on information and literature use in a research and development organization, Hogg & Smith (1959:143) report that 16 out of 102 respondents (15,7 %) indicated that the library had insufficient, or insufficiently trained staff.
- Slater (1984a:71,84,101) reports that of the improvements needed in services provided, 45 of the 448 respondents (about 10 %) suggested that more staff was needed, 63 respondents (about 14 %) needed staff of better quality, and 13 respondents (about 2,9 %) indicated that staff with more motivation was needed. Asked what improvements should be included in a new library or information service, 20 % of the respondents recommended the introduction of expert, efficient and qualified staff. Library personnel were described as "passive, reactive, apathetic, dull and boring" (35 % of respondents), while the most important virtue was indicated as "helpful, serice-motivated" by 24 % of the respondents.
- In her study on determing the information needs of researchers by subject specialists, Du Preez (1988:28-29) established that six of the thirteen subject specialists used the interview method, and concludes that this method is not sufficiently used.
- Hernon & McClure (1987:4,44) reveal the low percentage of correct answers to reference questions (37 % to 80 % correct).

5.22.2 The seriousness of the barrier of unsuitable personnel as identified by the target group

Determining the seriousness of the barrier of unsuitable personnel is, because of the many facets of personnel, very difficult and unfair towards the LIS if only some facets are tested and generalized. Because of this complexity, because of the contentiousness of the issue and also because the element of personnel is active in all LIS activities, and is, therefore, to a certain extent, already reflected in the other barriers, the seriousness of the barrier of unsuitable personnel was not tested by formula or by alternative method. Instead, the comments made by the researchers

identifying the barrier were tested for extent, supplemented by some additional relevant comments thought necessary to illustrate the barrier. The following aspects were selected for testing:

- the extent to which interviews are conducted to establish information needs;
- the capacity of LIS personnel to select new publications;
- the capacity of LIS personnel to initiate references to published information;
- whether the use of the LIS was reduced because personnel lack either information searching strategy, subject knowledge or because personnel are unreliable or inefficient;
- the extent of non-use or low use of subject specialists.

5.22.2.1 Extent to which interviews are conducted to determine information needs (Q 14.1)

Personnel of the LIS should at all times be aware of the current and future information needs of the researchers they serve. The recommended and most successful method of establishing information needs, according to Whitehall (1979:21,24), Auster (1983:48-49) and Webb (1983:4), is by interview. To test the extent to which this method was used, the target group was asked whether interviews to establish information needs are conducted, and if so, by whom. Of the 60 respondents, 18 (30,0 %) indicated that interviews were conducted and the remaining 42 respondents (70,0 %) indicated that no interviews were conducted. Of the interviews that were conducted, all were conducted by the subject specialist or head of the divisional library and LIS, no interviews being conducted by either the head of the LIS, the lending staff, order department staff or any other LIS staff.

5.22.2.2 Capacity of LIS personnel to select new publications on the research subject and the research topic (Q 7.2)

The development and maintenance of a balanced and representative bookstock for research is an important responsibility of the LIS. It is thus imperative that suitably qualified personnel, usually the subject specialist, actively participates in the selection of new publications on the general research subject and specifically on the research topic.

The respondents were requested to give their opinion on the capacity of the LIS personnel to select new publications on a) their research subject and b) their research topic. Of the 60 respondents, 42 indicated the capacity of LIS subject specialists, 6 the capacity of divisional librarians and 12 the capacity of staff at the reference counter. The combined responses, expressed as percentage of times the LIS personnel is able to select, are reflected in Table 46.

Table 46: Distribution of capacity of LIS personnel to select new publications on the research subject and the research topic

Selection capacity	DISTRIBUTION OF CAPACITY OF LIS PERSONNEL TO SELECT NEW PUBLICATIONS Research subject %	Research topic %
Do not know	15,0	16,7
Cannot select at all	31,7	36,7
Can select 1-20 %	16,7	20,0
Can select 21-40 %	8,3	8,3
Can select 41-60 %	11,7	8,3
Can select 61-80 %	6,6	1,7
Can select 81-99 %	10,0	8,3
Can select 100 %	0,0	0,0

(Column totals = 100)

It was also thought relevant to establish whether the selection capacity of LIS personnel differed significantly among subject attended to by a) subject specialists (at HSRC, AEC, PU, RAU), b) divisional librarians (at UWITS), and c) the centralized service without subject specialists (at UWITS, SAIMR). The responses are presented in Table 47.

Table 47: Distribution of capacity of LIS personnel to select new publications by type of organization

Selection capacity	RESEARCH SUBJECT a % N=42	b % N=6	c % N=12	RESEARCH TOPIC a % N=42	b % N=6	c % N=12
Do not know	14,3	33,3	8,3	16,7	33,4	8,4
Cannot select at all	23,8	33,3	58,4	28,6	33,3	66,7
Can select 1-20 %	21,4	16,7	0,0	23,8	33,3	0,0
Can select 21-40 %	9,5	0,0	8,3	9,5	0,0	8,3
Can select 41-60 %	14,3	0,0	8,3	9,5	0,0	8,3
Can select 61-80 %	7,2	16,7	0,0	2,4	0,0	0,0
Can select 81-90 %	9,5	0,0	16,7	9,5	0,0	8,3
Can select 100 %	0,0	0,0	0,0	0,0	0,0	0,0

(Column totals = 100)

As the capacity of the LIS personnel might also differ among the subjects, the responses are also tabulated by discipline in Table 48.

Table 48: Distribution of capacity of LIS personnel to select new publications on the research subject and the research topic, by discipline. N=15

Selection capacity	Education	Sociology	Physics	Medicine
	RESEARCH SUBJECT			
Do not know	8,3	16,7	25,0	0,0
Cannot select at all	8,3	33,3	16,7	58,3
Can select 1-20 %	8,3	16,7	33,3	16,7
Can select 21-40 %	16,7	0,0	16,7	0,0
Can select 41-60 %	16,7	25,0	0,0	8,3
Can select 61-80 %	16,7	0,0	8,3	0,0
Can select 81-90 %	25,0	8,3	0,0	16,7
Can select 100 %	0,0	0,0	0,0	0,0
	RESEARCH TOPIC			
Do not know	8,4	16,7	33,4	0,0
Cannot select at all	8,3	41,7	25,0	66,7
Can select 1-20 %	25,0	8,3	33,3	16,7
Can select 21-40 %	8,3	8,3	8,3	8,3
Can select 41-60 %	16,7	16,7	0,0	0,0
Can select 61-80 %	8,3	0,0	0,0	0,0
Can select 81-90 %	25,0	8,3	0,0	8,3
Can always select	0,0	0,0	0,0	0,0

(Column totals = 100 for each section)

Table 49: Distribution of capacity of LIS personnel to select new publications on the research subject, by organization

Selection capacity	HSRC	AEC	SAIMR	PU	UWITS	RAU
N =	12	6	6	12	12	12
	ORGANIZATION					
Do not know	25,0	16,7	0,0	8,4	25,0	8,3
Cannot select at all	16,7	16,7	66,7	41,7	41,7	16,7
Can select 1-20 %	0,0	33,3	0,0	25,0	8,4	33,3
can select 21-40 %	16,7	16,7	0,0	8,3	8,3	0,0
can select 41-60 %	25,0	0,0	0,0	8,3	8,3	16,7
can select 61-80 %	0,0	16,6	0,0	8,3	8,3	8,3
can select 81-99 %	16,6	0,0	33,3	0,0	0,0	16,7
can select 100 %	0,0	0,0	0,0	0,0	0,0	0,0

(Column totals = 100)

5.22.2.3 Capacity of LIS personnel to initiate references to published information (Q 6.1)

In order to be effective in supporting the research effort, LIS personnel are expected to adopt a preactive rather than an reactive approach. This implies that LIS personnel continuously search for and initiate relevant references, irrespective of whether or not they have been asked for much references.

To establish the extent to which LIS personnel supply preactive information, the respondents were asked what percentage of all references to published information was initiated by the researcher's own initiative and by the initiative of the LIS.

The respective responses, expressed by percentage references supplies, are reflected in Table 50.

Table 50: Extent of references to published information originating from own initiative and from the initiative of the LIS (Q 14.2)

	ORIGIN OF REFERENCES TO PUBLISHED INFORMATION	
Extent	Own initiative %	LIS initiative %
0 % references supplied	0,0	73,3
1-20 %	0,0	15,0
21-40 %	1,7	3,3
41-60 %	6,7	6,7
61-80 %	10,0	1,7
81-99 %	8,3	0,0
100 %	73,3	0,0

(Column totals = 100)

The data collected in response to question 6.1 (a) "how frequently does the LIS supply you with unsolicited references to publications or information", as analyzed in Table 6 (Chapter 4.7), supplements the data of Table 48. Those responses indicated that:

- 16,7 % of the respondents were contacted once a week with unsolicited references;
- 10,0 % once a month;
- 8,3 % once in three months;
- 1,7 % less often, and
- 63,3 % were never contacted with unsolicited references.

5.22.2.4 Reduced use of LIS reference services because of shortcomings in its subject specialists (Q 14.6)

It is possible that researchers, because of the weak services provided by LIS personnel, reduce the use of the reference service. To test the possible presence of such a reduction, the respondents were asked whether they had reduced the use of the reference service because the subject specialists

- lacked information searching strategy or
- lacked subject knowledge or
- were unreliable or inefficient.

The responses to these three questions, expressed in terms of the target group, are outlined in Table 51.

Table 51: Reduced use of LIS reference service because of shortcomings in its subject specialists

Type of shortcoming	EXTENT OF DECREASE OF USE		
	No service	No decrease of use	Decrease in use
Lack of searching strategy	30,0	41,7	28,3
Lack of subject knowledge	30,0	16,7	53,3
Unreliable/inefficient	30,0	46,7	23,3

Expressed in terms of the 42 respondents provided with subject specialist services, 40,5 % reduced their use of the reference service because the subject specialists lacked information searching strategy, 76,2 % because of their lack of subject knowledge and 33,3 % because of their unreliability and or inefficiency. These responses are analyzed in Table 52 according to the organizations providing subject specialist services.

Table 52: Reduced use of LIS reference services, by organization

Type of shortcomming N = 42:		ORGANIZATION HSRC 12	AEC 6	PU 12	RAU 12
Lack of searching strategy:	Yes	33,3	33,3	66,7	33,3
	No	66,7	66,7	33,3	66,7
Lack of subject knowledge:	Yes	50,0	83,3	66,7	66,7
	No	50,0	16,7	33,3	33,3
Unreliable/inefficient:	Yes	0,0	33,3	33,3	58,3
	No	100,0	66,7	66,7	41,7

5.22.2.5 The extent of non-use or low use of subject specialists services

The possibility that the non-use or the low use of subject specialist services might be caused, amongst other factors, by deficiencies in the quality of personnel offering the services, should be investigated. Of the target group, 18 were not provided with subject specialist services and are not involved in this evaluation. Of the remaining 42 respondents, 16 (38,1 %) never used their services and a further two respondents (4,8 %) had last used the services longer than a year ago. Only 23 of the 42 respondents (54,8 %) used subject specialist services during the last three months.

The next step in the evaluation is to arrive at a measure of efficiency of the services by relating the non-use or low use to the various organizations and to the negative comments towards the subject specialist services in these organizations.

The analysis of the frequency the subject specialist services are consulted, as shown in Table 53, provides greater insight.

Table 53: Frequency subject specialist services are consulted. N=42

Last consultation	ORGANIZATION HSRC	AEC	UP	RAU
Longer than 3 months ago or never	0,0	66,7	58,3	66,7
During the last 3 months	100,0	33,3	41,7	33,3

(Column totals = 100)

5.22.3 Summary of the barrier of unsuitable personnel

The literature

* Respondents suggesting more or better qualified staff: 10,0 % to 15,7 %.

The target group

* Percentage respondents with whom no interviews are conducted to establish information needs: 70,0.
* Most frequent capacity of LIS personnel to select new publications on the research subject: cannot select at all - 31,7 % of the respondents.
* Most frequent capacity of LIS personnel to select new publications on the research topic: Cannot select at all - 36,7 % of respondents.
* Most frequent service (with either subject specialists, divisional library service or centralized service) in which LIS personnel cannot select new publications: Centralized service without subject specialists - 58,4 % of respondents in the category for selecting new publications on the research subject and 66,7 % of respondents for selecting new publications on the research topic.
* Most frequently mentioned discipline in which LIS personnel cannot select new publications: Medicine - 58,3 % of the respondents in the category for selecting new publications on the research subject and 66,7 % of the respondents for selecting new publications on the research topic.
* Most frequent extent of references initiated by the LIS: No reference supplied - 73,3 % of the target group.
* Percentage respondents who were never contacted with references: 63,3.
* Percentage respondents who reduce their use of the LIS because personnel:
  - lack information searching strategy: 40,5 % of the incidence group, i.e. 28,3 % of the target group
  - lack subject knowledge: 76,2 % of the incidence group, i.e. 76,2 % of the target group
  - are unreliable or inefficient: 33,3 % of the incidence group, i.e. 23,3 % of the target group.

It is difficult to summarize this data so that a figure can be obtained for inclusion in the list of barriers at the end of this chapter. Because many aspects of the barrier were perhaps not tested and the aspects covered are not as fully representative of the barrier as are the figures for the other barriers, and because this barrier is partially represented in the other barriers covered, and also because of the sensitivity of the issue of unsuitable personnel, it was decided not to calculate its seriousness for inclusion in the list at the end of this chapter.

This concludes the outline of the data collected on the seriousness of the 22 specific barriers covered by the report. The only aspect remaining before summarizing the collected data is to look at the additional barriers identified during the interview.

5.23 ADDITIONAL BARRIERS IDENTIFIED DURING THE INTERVIEWS

After attending to the specific barriers included in the questionnaire, the respondents were given the opportunity to identify any additional barriers that obstruct access to published information in research (question 21).

Of the 60 respondents, 57 submitted 346 unsolicited comments. No new barriers were however identified, only aspects of barriers that pertain to barriers either

- included in the questionnaire;
- identified in Chapter 2 but not included in the questionnaire as they were not considered as important barriers;
- not inherent in the LIS but rather encountered outside the published information cycle (Figure 2).

This shows that the coverage of barriers was adequate for the purpose for which it was intended.

Because these 364 comments make interesting reading and because they illustrate the wide variety of important and not so important aspects that make up a barrier, they were considered important to be included as Appendix 9 on page 198. The interpretation of these comments follows in Chapter 6.

The summary of the collected data on the seriousness of barriers starts on the next page.

5.24 SUMMARY OF COLLECTED DATA

The purpose of Chapter 5 was to compile a list of barriers in order of seriousness. This list can now be compiled from the figure calculated at the end of every section from 5.1 to 5.21. The list is initially presented in two parts, the barriers for which the seriousness was measured by formula s = f + e1 + e2 + t are listed under Category A, and those measured by alternative methods are listed under Category B. The sequence is in descending order of seriousness. The seriousness for the different aspects of the same barrier are presented separately according to their individual value, e.g. the barrier of gaps in the collection is expressed for journals, monographs, foreign language publications, reference tools, and for abstract and index journals. Because a different scale was used for measuring the barriers under Category A and B, the values of seriousness do not overlap. The only barrier appearing in both categories is the barrier of processing delays, because the delays in processing new monographs, interloans, and requests for information were measured by the formula s = f + e1 + e2 + t, whereas the processing delays for binding were measured by the alternative method.

The seriousness of barriers

Category A: Barriers measured by s = f + e1 + e2 + t.

Highest possible reading: 400
Lowest possible reading: 0

Placing:

1	Barrier of gaps in the collection: journals	260,9
2	Foreign language barrier	255,8
3	Barrier of gaps in the collection: monographs	251,1
4	Barrier of processing delays: new monographs	235,1
5	Barrier of processing delays: -interloans from other LIS in the RSA	230,7
6	Barrier of processing delays: -requests for publications from own LIS	213,9
7	Barrier of processing delays: -interloans from overseas LIS	197,6
8	Barrier of inferior information quality: -repetitive information	194,3
9	Barrier of processing delays: -information requested from own LIS	192,6
10	Barrier of information scarcity	192,4
11	Barrier of inferior information quality: -inaccurate/out of date information	184,3
12	Barrier of inferior information quality: -information from inferior research	183,7
13	Barrier of processing delays: new journals	172,3
14	Barrier of information congestion	161,7
15	Barrier of gaps in the collection: -foreign language publications	157,9
16	Barrier of gaps in the collection: reference tools	144,1
17	Barrier of gaps in the collection: -abstract & index journals	124,9
18	Barrier of obsolete and surplus publications in the LIS	89,5
19	Barrier of inadequate subject-indexing level: -subject catalogue	88,4

Category B: Barriers measured by alternative methods

Highest possible reading: 100
Lowest possible reading: 0

Placing:

1	Barrier of missing publications	68,3
2	Barrier of publishing delay: conference papers	61,7
3	Barrier of publishing delay: journal articles	61,7
4	Barrier of unpublished information	58,3
5	Barrier of incorrect or incomplete bibliographic references: -journal articles	53,3
6	Barrier of processing delays: binding	51,7
7	Barrier of complex arrangement and layout of the collection	46,7
8	Barrier of unreliable reference tools: -insufficient access provided by indexes in books	46,7
9	Poor strategy for information searching barrier	41,5
10	Barrier of unreliable reference tools: -insufficient access provided by abstract or index journals	40,0
11	Barrier of information published in obscure publications	40,0
12	Barrier of unreliable reference tools: -insufficient access provided by abstracts of articles	36,7
13	Barrier of incomplete coverage by abstract and index journals	30,0
14	Barrier of geographic distance: -dispersal of information sources on the shelves	28,3
15	Barrier of irrelevant information	25,0
16	Barrier of unreliable reference tools: -insufficient access provided by databases	25,0
17	Barrier of unreliable reference tools: -omission of important keywords from abstracts or indexes	23,3
18	Barrier of publishing delay: abstract and index journals	23,3
19	Barrier of geographic distance: -distance to information sources among the different LIS	21,7
20	Barrier of late and inaccurate book reviews: -inaccurate description of new publications in book reviews	21,7
21	Barrier of unnecessary duplication of research	20,0
22	Barrier of late and inaccurate book reviews: -publishing delay with book reviews	18,3
23	Barrier of incorrect or incomplete bibliographic references: -abstract and index journals	8,3

As mentioned, the seriousness of several of the above barriers are expressed separately for the different categories of the barrier. This has the advantage that the differences in seriousness of the various aspects of the same barrier are indicated, but has the disadvantage that the different readings of seriousness are dispersed amongst the readings for other barriers and that the overall seriousness of the barrier is not indicated. To present a more simplified indication of the overall seriousness of these compound barriers, the average reading of each barrier is calculated by adding the different values of seriousness and dividing the product by the number of readings. This does change the sequence of some barriers. This arrangement is as follows:

Category A: Barriers measured by formula s = f + e1 + e2 + t.

Highest possible reading: 400
Lowest possible reading: 0

Placing:

1	Foreign language barrier	255,8
2	Barrier of processing delays	207,1
3	Barrier of information scarcity	192,4
4	Barrier of gaps in the collection	187,8
5	Barrier of inferior information quality	187,0
6	Barrier of information congestion	161,7
7	Barrier of obsolete and surplus publications in the LIS	89,5
8	Barrier of inadequate subject-indexing level	88,4

Category B: Barriers measured by alternative methods

Highest possible reading: 100
Lowest possible reading: 0

Placing:

1	Barrier of missing publications	68,3
2	Barrier of unpublished information	58,3
3	Barrier of processing delays: Binding	51,7
4	Barrier of publishing delay	48,9
5	Barrier of complex arrangement and layout of the collection	46,7
6	Poor strategy for information searching barrier	41,5
7	Barrier of information published in obscure publications	40,0
8	Barrier of unreliable reference tools	34,3
9	Barrier of incorrect or incomplete bibliographic references	30,8
10	Barrier of incomplete coverage by abstract and index journals	30,0
11	Barrier of irrelevant information	25,0
12	Barrier of geographic distance	25,0
13	Barrier of late and inaccurate book reviews	20,0
14	Barrier of unnecessary duplication of research	20,0

For the synthesis and interpretation of the collected data the readings of the first listing, i.e. with separate reading for the seriousness of each aspect of a barrier, are used. The differences in seriousness amongst the different aspects of the same barrier are too significant to be averaged in one reading of seriousness.

5.25 SUMMARY OF CHAPTER 5

In Chapter 5 the 22 more serious barriers were measured either according to the formula s = f + e1 + e2 + t, or by one of the alternative methods indicated in 1.2.3.4. For the former barriers a figure representing the seriousness of the barrier was compiled from its frequency, effect on the acquisition of information, effect on the research project and on the trend of the barrier. The seriousness of the barriers not measured by formula was determined by one of the alternate methods involving frequency. All figures of seriousness are expressed in terms of the target group of 60 researchers and are therefore comparable. The readings for the seriousness of the barriers was listed in two sequences in descending order.

This concludes the main part of the report. The synthesis, interpretation, or discussion of the collected data is presented in the next chapter.

CHAPTER 6: SYNTHESIS AND INTERPRETATION OF THE COLLECTED DATA AND EVALUATION OF THE PROJECT

Purpose, scope and arrangement of Chapter 6

The purpose of the research project was to identify the barriers researchers experience in gaining access to published information, to measure the seriousness of the most important barriers and to list the barriers according to seriousness, so indicating the sequence in which their removal is suggested. This was dealt with in the five preceding chapters. In this chapter the

- collected data is synthesized and interpreted;
- research method used evaluated;
- potential benefits of the project indicated;
- outline of conclusions drawn; and
- recommendations briefly described.

6.1 SYNTHESIS AND INTERPRETATION OF THE COLLECTED DATA

As the project is primarily exploratory, and as the approach and the collected data is more general than specific, the interpretations can also only be more general than specific. The synthesis and interpretation of the collected data covers:

- the listing of barriers according to seriousness;
- the listing of barriers according to frequency, effects, and trend;
- the synthesis of the additionally collected data;
- the synthesis of barriers according to their origin in the cycle of published information in research.

6.1.1 Comments and interpretation of the listing of barriers according to seriousness

After having collected and processed so much data, the first attention on examining the list in 5.24 on pages 140 and 141 must surely go to the extent of the seriousness of barriers, and the placing of barriers in relation to each other. As concerns the seriousness of the Categoty A barriers, the figure for the maximum possible seriousness of a barrier was established at 400 (i.e. if all the researchers experience the maximum effect of a barrier with increasing trend of seriousness). The corresponding figure for half the target group with barrier effects of category three and a constant trend would record a seriousness reading of 143,3 and the seriousness of a barrier experienced by half the target group with the minimum effect, for a barrier with a decreasing trend, would come to 86,6 (as explained at the top of page 62). Although the minimum barrier seriousness lies with zero, the latter calculation shows that a more realistic minimum seriousness for the Category A barriers lies higher. For placing the Category B barriers into context of seriousness, their range varies from zero to 100.

For the Category A barriers, the range for seriousness is from 88,4 to 260,9. Expressed in percentage of 400, this would mean that the seriousness ranges from about 22 % to 65 % of the maximum seriousness. The seriousness of the Category B barriers lies in the range from 8,3 to 68,3 of the maximum seriousness. Against this background and the data provided in the list of barriers in 5.24, and accepting that the minimum seriousness of a barrier is zero, it is apparent that the researchers involved in this project did experience barriers. It is interesting to see that the range for the Category B starts lower at about 8 % which is lower than the range for the Category A barriers which starts at 22 %, this indicating that the inclu-

sion of the barriers that scored the lowest seriousness readings in the list of the Category B barriers was correct. It is also interesting to note that for both the the maximum seriousness rate of barriers in Category A and B is about equal at 65 % and 68 %. Furthermore the distribution of the barriers in both the categories is even and the increase in seriousness is steady. This shows that barriers have different seriousness.

As concerns the individual placing of a barrier in relation to another barrier in the list, or the placing of groups of barriers, the following comments can be made about the Category A barriers:

- The barrier of gaps in the collection (for journals) was indicated by the target group as the most serious barrier. Because of the importance of publications as source for research information, the placing of this barrier in first priority of seriousness and the barrier of gaps in the collection (for monographs) in third priority of seriousness can be accepted.
- The importance of publications for research is not restricted to the publications written in the language or languages the researcher can understand, but extends to foreign language publications. South Africa as a rapidly developing country and industrial, agricultural and scientific leader of Southern Africa, has to have access to those foreign research results that can be locally applied. Lack of such access is as severe as is a gap in the collection of the LIS. It is thus no wonder that 56,7 % of the respondents indicated that this barrier decreased the quality of their research - the highest seriousness effect for any of the barriers covered. Seen against the poor foreign language proficiency of the researcher, the virtual absence of a local translation service and the disadvantages associated with translations, the placing of this barrier in second position is justified.
- The high priority allocated by the target group to the barrier of processing delays (4th to 7th and 9th position) might come as a surprise to some readers. But these positions are justified, for this barrier continues the central theme of gaps in the collection. Publications not available due to processing delays constitute gaps in required information.
- The next group of barriers are aspects of the barrier of inferior information quality, and occupying 8th, 11th and 12th positions respectively. With regard to the aspect of repetitive information of this barrier, it is difficult to accept the statements in the literature that only from about 2 % to 8 % of newly published information is 'new' information, i.e. that the rest is redundant or superfluous. But the high priority researchers have allocated to this barrier indicates a higher level of seriousness than a librarian, who traditionally might be inclined to strive for comprehensiveness rather than quality, would have allocated to this barrier. The position of this barrier in the list is accepted.
- The barrier of information scarcity, i.e. too little or no information, appeared higher on the list than was expected. But then real research is advancing knowledge into the unknown, and there can be no real research, i.e. advancing of knowledge if everything were already known.
- Of all the barriers identified, the barrier of information congestion seems to be the most popular, most treated in the more popular contributions to the literature, and also the barrier most blamed for problems in information retrieval. Without doubt, many would have placed it at the top of the list. The 14th position the barrier occupies is however a more realistic placing, primarily because the researcher has a well-developed inbuilt capacity to handle large amounts of information. An increase in the number of publications does not imply a corresponding reduction in capacity to handle that increase. And should the barrier preclude access to information, this may have the advantage of excluding

irrelevant, repetitive, inaccurate/out of date or information of inferior quality. This barrier would occupy an even lower position in the list if more researchers were willing to delegate more of their information searching to suitably qualified LIS personnel and if these were to become more active in the evaluation and repackaging of information.

- The sequence in which the researchers rated the seriousness of the different aspects of the barrier of gaps in the collection would confirm the sequence obtained by ranking these aspects according to experience gained in serving researchers. Thus the barrier of gaps in the collection for abstract and index journals (17th position) is accepted as being not as serious as is the barrier of gaps for reference tools (16th) and for foreign language publications (15th), though the latter, because of the importance of foreign language publications, should have occupied a higher position in the list.
- The barrier of obsolete and surplus publication in the LIS, in 18th position of the barriers listed under Category A, is related to the barrier of information congestion, and its position is justified. Researchers, because of their command of the subject, should be able to recognize obsolete information in the publications in the LIS.
- Because of the importance of the subject catalogue for indicating information contained in monographs, the barrier of inadequate subject-indexing level was expected to occupy a higher than the 19th position in the list. Had those researchers who never use the subject catalogue (51,7 %) participated and indicated their views on the seriousness of this barrier, the placing in Category A would have been considerably higher because most of the reasons provided for not using the catalogue pertained to its ineffectiveness.
- The most dominant of the Category B barriers is the barrier of missing publications. Seen in relation with the most serious barrier from the Category A barriers, this may be interpreted that LIS do not only have gaps in their collection, but that these gaps are compounded by publications that were acquired but are missing.
- The next group of four barriers in sequence originate with the publisher and the researcher, and pertain to the barrier of publishing delay, the barrier of unpublished information and the barrier of incorrect or incomplete bibliographic references. The placing of the barrier of publishing delay is higher than expected, but can be justified if considered against the penalties for unnecessary duplication of research. Information that exists but is not published also represents a serious gap, for such information is usually very specialized and scarce. Because the frequency of coming across incorrect or incomplete bibliographic references in the literature was thought to be low, the seriousness of the barrier was expected to be low. The seriousness was however rated higher by the target group than expected.
- In the list of Category A barriers, the barrier of processing delays (for new monographs, loans and interloans) featured from 4th to 7th position. In Category B, the barrier of processing delays (for binding) features in 6th position. This supports the overall priority allocation of this barrier in the sequences.
- The barrier of complex arrangement and layout of the collection features in 7th position and is related to the poor strategy for information searching barrier in 9th position. Both barriers indicate insufficient LIS orientation for the researcher. Their position in the list is accepted.
- From the tenth position and including the eigth position, all except four of the remaining barriers in the list are associated to publishing or the researcher. They represent minor barriers. Of the four, three relate to the LIS (barrier of geographic distance and the barrier of irrelevant information). The placing of the latter barrier in such a low

priority of seriousness can only be explained by the low percentage (56,7 %) of information supplied by the LIS, the barrier seriousness being expressed in terms of the target group and not the barrier group. The 4th barrier not part of the group of barriers related to publishing, is the barrier of unnecessary duplication of research. As mentioned in 2.1.31, this barrier arises through many different factors, which makes it difficult to include this barrier in the interpretation.

Although these few comments on the position of the barriers in the list are arbitrary and are also partly based on experience gained in promoting access to information for researchers, it seems as though the devised methods of measuring the seriousness of barriers can provide a list in order of seriousness that is acceptable.

Further inspection of the lists will reveal a pattern of distribution of seriousness according to origin of the barrier in the information cycle, i.e. external to the LIS (publisher or researcher) or internal, i.e. a system barrier of the LIS. The Category A and B list contains 42 barriers or aspects of barriers. If the barrier of information scarcity, the barrier of unpublished information, and the barrier of unnecessary duplication of research (listed as number 10 in Category A, and 4 and 21 in Category B) are excluded because their origin is difficult to categorize, then 39 barriers remain. The Category A list then contains 14 barriers with their origin in the LIS (numbers 1-7, 9, 13, 15-19), and four barriers originating with the publisher or researcher (number 8, 11-12, 14). The Category B list contains seven barriers originating with the LIS (numbers 1, 6, 7, 9, 14, 15, 19), and 14 originating with the publisher or researcher (2, 3, 5, 8, 10-13, 16-18, 20-21, 23). Therefore 21 of the 39 barriers originate in the LIS and the other 18 with the publisher or researcher. Looking at the placing and distribution of barriers in Category A (the barriers considered to be more serious than the Category B barriers), it is apparent that the barriers originating in the LIS, although they outnumber the other barriers by fourteen to five, predominantly occupy the top positions, the four other barriers being ranked lower in positions 8th, 11th to 12th and 14th. The categorization according to distribution of the 21 barriers in the Category B list (the less serious barriers) indicates an even distribution of LIS barriers throughout the list. Broadly interpreted, this implies that the barriers originating in the LIS, are on the whole, more numerous and more serious than the barriers originating from the other two participants in the information cycle.

The above categorization of barriers according to their origin can be used to compile a list in priority order of seriousness that indicates the suggested sequence in which barriers could be removed or reduced by the LIS and by the publisher or researcher respectively.

<u>The priority order of LIS barriers</u>
<u>Category A barriers</u>

Placing		Rating
1	Barrier of gaps in the collection: journals	260,9
2	Foreign language barrier	255,8
3	Barrier of gaps in the collection: monographs	251,1
4	Barrier of processing delays: new monographs	235,1
5	Barrier of processing delays:interloans from other LIS in the RSA	230,7
6	Barrier of processing delays: requests for publications from own LIS	213,9
7	Barrier of processing delays:interloans from overseasLIS	197,6

8	Barrier of processing delays: information requested from own LIS	192,6
9	Barrier of processing delays: new journals	172,3
10	Barrier of gaps in the collection: foreign language publications	157,9
11	Barrier of gaps in the collection: reference tools	144,1
12	Barrier of gaps in the collection: abstract & index journals	124,9
13	Barrier of obsolete and surplus publications in the LIS	89,5
14	Barrier of inadequate subject-indexing level: subject catalogue	88,4

Category B barriers

1	Barrier of missing publications	68,3
2	Barrier of processing delays: binding	51,7
3	Barrier of complex arrangement and layout of the collection	46,7
4	Poor strategy for information searching barrier	41,5
5	Barrier of geographic distance: dispersal of information sources on the shelves	28,3
6	Barrier of irrelevant information	25,0
7	Barrier of geographic distance: distance to information sources among the different LIS	21,7

The priority order of barriers originating with the publisher or the researcher

Category A barriers

1	Barrier of inferior information quality: repetitive information	194,3
2	Barrier of inferior information quality: inaccurate/out of date information	184,3
3	Barrier of inferior information quality: information from inferior research	183,7
4	Barrier of information congestion	161,7

Category B barriers

1	Barrier of publishing delay: conference papers	61,7
2	Barrier of publishing delay: journal articles	61,7
3	Barrier of incorrect or incomplete bibliographic references: journal articles	53,3
4	Barrier of unreliable reference tools: insufficient access provided by indexes in books	46,7
5	Barrier of unreliable reference tools: insufficient access provided by abstract or index journals	40,0
6	Barrier of information published in obscure publications	40,0
7	Barrier of unreliable reference tools:insufficient access provided by abstracts of articles	36,7
8	Barrier of incomplete coverage by abstract and index journals	30,0
9	Barrier of unreliable reference tools:insufficient access provided by databases	25,0
10	Barrier of unreliable reference tools: omission of important keywords from abstracts or indexes	23,3
11	Barrier of publishing delay: abstract and index journals	23,3
12	Barrier of late and inaccurate book reviews: inaccurate description of new publications in book reviews	21,7
13	Barrier of late and inaccurate book reviews: publishing delay with book reviews	18,3
14	Barrier of incorrect or incomplete bibliographic references: abstract and index journals	8,3

6.1.2 Synthesis and interpretation of the collected data on the frequency, effects and trend of barriers

Although the formula for measuring the seriousness of barriers contains the components of frequency, effects and trend, the data on these three aspects is distributed throughout Chapter 5 and is not conducive to analysis and interpretation without a summary. Additional insight to the seriousness of barriers can be obtained with a synthesis of this data, allowing for a comparison of the frequencies, effects and trends amongst barriers.

6.1.2.1 Synthesis and interpretation of the collected data on the frequency of barriers

The data for the frequency of barriers are presented seperately in Table 54 and Table 55 for barriers measured by formula and for those measured by alternative methods respectively. To facilitate comparison, the figures are presented in terms of the target group, i.e. 60. The arrangement is in descending order of frequency in the last column. The figures for the 'do not know' responses and the 'did not experience the barrier' are included. The interpretation of Table 54 and Table 55 follows Table 55.

Table 54 is compiled from the data presented in section 5.2.2; Table 15 in 5.6.2.1; Table 19 in 5.7.2.1; section 5.10.2.1 and 5.11.2.1; Table 34 in 5.12.2; section 5.14.2.1; and Table 42 in section 5.19.2.1.
Table 55 is compiled from the responses as taken from Table 9 in section 5.1.2; sections 5.3.2, 5.4.2.3 and 5.4.2.4; Table 14 in 5.5.2; sections 5.8.2, 5.9.2, 5.13.2.1, 5.13.2.2 and 5.16.2.1, Table 41 in 5.16.2.2; sections 5.17.2, 5.18.2 and 5.19.2.4.

Table 54: Percentage of target group experiencing the barriers measured by formula

Name of barrier	PERCENTAGE OF TARGET GROUP EXPERIENCING THE BARRIER do not know	did not experience	did experience
Barrier of gaps in the collection: -journals	0,0	15,0	85,0
Processing delays: -interloans other LIS in RSA	10,0	8,4	81,6
Barrier of gaps in the collection: -monographs	3,3	16,7	80,0
Processing delays: -new monographs	15,0	13,3	71,7
Processing delays: -loans from the own LIS	15,0	13,4	71,6
Barrier of inferior information quality: -repetitive information	1,7	28,3	70,0
Foreign language barrier	0,0	36,6	63,4
Barrier of information scarcity	0,0	36,7	63,3
Barrier of inferior information quality: -inaccurate, out of date	5,0	31,7	63,3
Barrier of inferior information quality: -from inferior research	5,0	31,7	63,3
Processing delays: -interloans overseas LIS	43,3	3,3	53,4
Processing delays: -requests for information	35,0	11,7	53,3
Barrier of information congestion	0,0	48,3	51,7
Barrier of obsolete and surplus publications in the LIS	11,7	53,3	35,0
Processing delays: -new journals	70,0	3,3	26,7
Barrier of gaps in the collection: -foreign language publications	51,7	25,0	23,3
Barrier of inadequate subject-indexing level (subject catalogue)	51,7	33,3	15,0
Barrier of gaps in the collection: -reference tools	16,7	68,3	15,0
Barrier of gaps in the collection: -abstract and index journals	15,0	81,7	3,3
Column totals	350,1	550,0	989,9
% distribution	18,5	29,1	52,4
Lowest reading	0,0	3,3	3,3
Highest reading	70,0	81,7	85,0
Average reading	23,3	29,5	52,1

Table 55: Percentage of target group experiencing the barriers measured by alternative methods

Name of barrier	PERCENTAGE OF TARGET GROUP Phenomenon experienced dnk	no	Barrier experienced no	yes
Barrier of missing publications	0,0	26,7	5,0	68,3
Barrier of publishing delay: -journal articles	3,3	25,0	10,0	61,7
Barrier of publishing delay: -conference papers	8,3	23,3	6,7	61,7
Barrier of unpublished information	0,0	38,4	3,3	58,3
Barrier of incorrect or incomplete bibliographic references: -in journal articles	0,0	26,7	20,0	53,3
Barrier of processing delays (binding)	0,0	30,0	18,3	51,7
Barrier of complex arrangement and layout of the collection	0,0	38,3	15,0	46,7
Barrier of unreliable reference tools: -detailed access: indexes in books	5,0	43,3	5,0	46,7
Barrier of information published in obscure publications	0,0	41,7	18,3	40,0
Barrier of unreliable reference tools: -detailed access: abstract & index journals	0,0	46,7	13,3	40,0
Barrier of unreliable reference tools: -detailed access: abstracts of articles	0,0	50,0	13,3	36,7
Barrier of incomplete coverage by abstract and index journals	0,0	70,0	0,0	30,0
Barrier of geographic distance: -dispersed among other disciplines	0,0	25,0	46,7	28,3
Barrier of unreliable reference tools: -detailed access: computerized data bases	25,0	41,7	8,3	25,0
Barrier of unreliable reference tools: -important keywords not included	0,0	70,0	6,7	23,3
Barrier of publishing delay: -abstract and index journals	35,0	41,7	0,0	23,3
Barrier of late and inaccurate book reviews: -inaccurate description	11,7	58,3	8,3	21,7
Barrier of geographic distance: -dispersed among different LIS	0,0	73,3	5,0	21,7
Barrier of late and inaccurate book reviews: -delays in book reviews	30,0	43,4	8,3	18,3
Barrier of incorrect or incomplete bibliographic references: -in abstract and index journals	3,3	81,7	6,7	8,3
Column totals	121,6	895,2	218,2	765,0
% distribution	6,1	44,7	10,9	38,3
Lowest reading	0,0	23,3	0,0	8,3
Highest reading	35,0	81,7	46,7	68,3
Average reading	15,2	44,8	12,1	38,3

The sequence in which the barriers are listed according to seriousness in section 5.24 on pages 140 and 141 and the sequence as listed in Table 54 and Table 55 does not differ significantly. As concerns the Category A barriers measured by formula, those barriers which were less frequently experienced but which recorded high scores for effects, lost their dominant position in the list in section 5.24 to the more frequently experienced barriers that recorded lower readings for effect, e.g. the foreign language barrier which dropped from 2nd in seriousness to 7th position in frequency, or the barrier of processing delays for interloans in the RSA, which rose from 5th position in seriousness to 2nd position in frequency. The fact that the barrier of gaps in the collection retains its dominant position in Table 54 shows that this barrier is not only the most serious but also the most frequent of the Category A barriers. From both Table 54 and Table 55 it can be interpreted that the serious barriers are generally also frequently experienced. But this was, at least to a certain extent, to be expected because the component frequency is part of the formula.

Both the methods of measuring seriousness of the barriers made use of the percentage of the target group that experienced the barrier for determining frequency. This data in tables 54 and 55 can be combined to indicate the percentage of the target group that experienced the barriers. Figure 1 on page 6 showed how the information process works through barriers or without barriers. By projecting the figures for the percentage distribution at the bottom of Table 54 and Table 55 onto Figure 1 we get a clear interpretation of the extent to which barriers are experienced. The percentage distribution of the target group is reflected in Figure 7 and Figure 8 respectively.

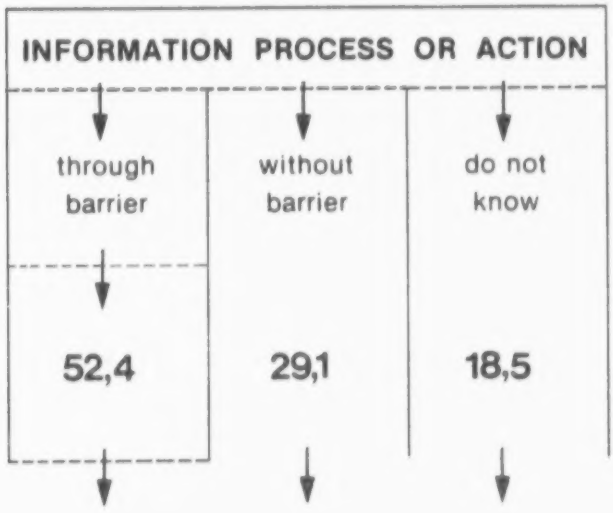

Figure 7: Distribution of target group in the information process for the barriers measured by formula

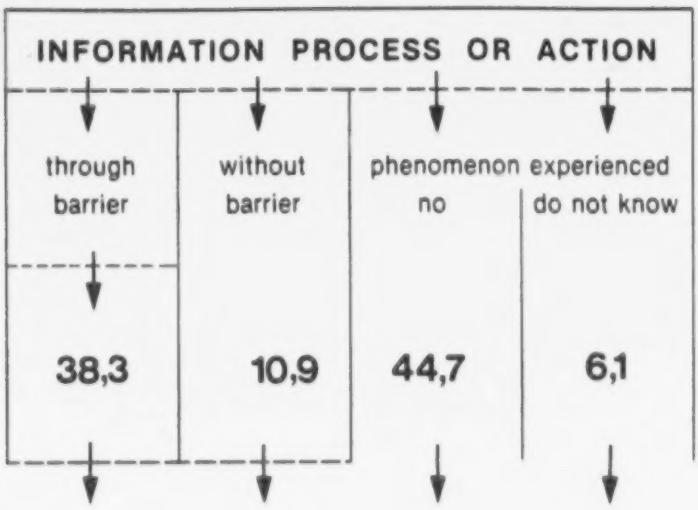

Figure 8: Distribution of target group in the information process for the barriers measured by alternative methods

This indicates that on average 52,4 % and 38,3 % of the target group experienced a barrier in the information process for the barriers measured by formula and by the alternative methods respectively. Although these are generalized figures, they do support the statement in 6.1.1 that the target group does experience barriers.

As mentioned, both the methods of measuring the seriousness of the barriers made use of the percentage of the target group that experienced the barrier for determining frequency. Thus the data in the last colum of Table 54 and Table 55 can be combined in Table 56 to give a percentage of the target group that experienced each of the 39 barriers or aspects of barriers.

No comments additional to those made at the top of page can be made to this listing.

In Chapter 5 an attempt was made in the summary of every barrier to compare the frequency or seriousness of that barrier as indicated in the literaure to the frequency as identified by the target group. Such a comparison proved disappointing, mainly because of a lack of comparable data. Where comparisons could be made, these cannot be regarded as reliable, but it does appear that to the target group the following barriers were more serious than the indicators identified from the literature: Barrier of publishing delay (page 68); barrier of gaps in the collection (page 89); barrier of complex arrangement and layout of the collection (page 90) and the barrier of inadequate subject-indexing level (page 106). The indicators of seriousness were about equal for the following barriers: Barrier of information congestion (page 111); barrier of incomplete coverage by abstract and index journals (page 118); barrier of processing delays (for new books only, page 126) and the barrier of unnecessary duplication of research (page 131). For all the other barriers no comparison could unfortunately be made. The comparison on barrier frequency is therefore not conclusive.

Table 56: Percentage of target group experiencing barriers

Placing	Barrier	PERCENTAGE OF TARGET GROUP EXPERIENCING THE BARRIER
1	Barrier of gaps in the collection: journals	85,0
2	Barrier of processing delays: interloans from other LIS in RSA	81,6
3	Barrier of gaps in the collection: monographs	80,0
4	Barrier of processing delays: new monographs on order	71,7
5	Barrier of processing delays: loans from the own LIS	71,6
6	Barrier of inferior information quality: repetitive information	70,0
7	Barrier of missing publications	68,3
8	Foreign language barrier	63,4
9	Barrier of information scarcity	63,3
10	Barrier of inferior information quality: inaccurate, out of date	63,3
11	Barrier of inferior information quality: from inferior research	63,3
12	Barrier of publishing delay: journal articles	61,7
13	Barrier of publishing delay: conference papers	61,7
14	Barrier of unpublished information	58,3
15	Barrier of processing delays: interloans overseas LIS	53,4
16	Barrier of processing delays: requests for information	53,3
17	Barrier of incorrect or incomplete bibliographic references: in journal articles	53,3
18	Barrier of information congestion	51,7
19	Barrier of processing delays (binding)	51,7
20	Barrier of unreliable reference tools: detailed access: indexes in books	46,7
21	Barrier of complex arrangement and layout of the collection	46,7
22	Barrier of unreliable reference tools: detailed access: abstract & index journals	40,0
23	Barrrier of information published in obscure publications	40,0
24	Barrier of unreliable reference tools: detailed access: abstracts of articles	36,7
25	Barrier of obsolete and surplus publications in the LIS	35,0
26	Barrier of incomplete coverage by abstract and index journals	30,0
27	Barrier of geographic distance: dispersed among other disciplines	28,3
28	Barrier of processing delays: new journals on order	26,7
29	Barrier of unreliable reference tools: detailed access: computerized data bases	25,0
30	Barrier of gaps in the collection: foreign language publications	23,3
31	Barrier of publishing delay: abstract and index journals	23,3
32	Barrier of unreliable reference tools: important keywords not included	23,3
33	Barrier of late and inaccurate book reviews: inaccurate description	21,7
34	Barrier of geographic distance: dispersed among different LIS	21,7
35	Barrier of late and inaccurate book reviews: delays in book reviews	18,3
36	Barrier of inadequate subject-indexing level (subject catalogue)	15,0
37	Barrier of gaps in the collection: reference tools	15,0
38	Barrier of incorrect or incomplete bibliographic references: in abstract and index journals	8,3
39	Barrier of gaps in the collection: abstract and index journals	3,3

6.1.2.2 Synthesis and interpretation of the collected data on the effects of barriers

As the data on the effects of barriers is distributed throughout Chapter 5, it is difficult to analyse and interpret for any possible additional details supporting the seriousness of bariers as indicated in 5.24 on pages 139 and 140.

According to the description of barriers on page 5, a barrier may have many different effects. In Figure 5 on page 20 the five different response options ranging from 'no effect' through to a 'decrease of project quality', were outlined. It can be surmised that those barriers registering a high seriousness rate in section 5.24 will register a low 'no effect' response, thus indirectly showing that it is not frequency alone that determined the seriousness of the barriers.

The anlaysis of 'no effect' responses for the eight barriers measured by formula, as recorded in Tables 12 and 13 in section 5.2.2, Tables 16 and 17 in 5.6.2, Table 21 and 22 in 5.7.2, Tables 26 and 27 in 5.10.2, Tables 31 and 32 in 5.11.2, Tables 35 and 36 in 5.12.2; Tables 38 and 39 in 5.14.2; and Tables 43 and 44 in 5.19.2, is summarized in Table 57 in ascending order of frequency mentioned, and indicates the extent of the 'no effect' responses.

Table 57: Frequency of 'no effect' responses for the eight barriers measured by formula

Name of barrier	FREQUENCY OF 'NO EFFECT' RESPONSES IN % Effect on the acquisition of information	Effect on the project
Barrrier of information scarcity	0,0	0,0
Barrier of processing delays	0,0	1,7
Barrier of information congestion	0,0	3,3
Foreign language barrier	0,0	3,3
Barrier of gaps in the collection	0,0	6,7
Barrier of inadequate subject-indexing level	3,3	5,0
Barrier of inferior information quality	8,3	8,3
Barrier of obsolete and surplus publications in the LIS	28,5	47,6

Except for the barrier of obsolete and surplus publications in the LIS (the barrier ranked as 18th of the nineteen barriers listed in 5.24), the percentage of 'no effect' responses in the barriers measured by formula is small. While this does not show that all the barriers with high readings for seriousness have low readings for 'no effect' (the last three barriers in Table 57 have low readings for seriousness), it does indicate that the component effect is as important ingredient of the formula as is the component frequency.

Management of LIS might be interested to know of the most frequently indicated effects of the different barriers. The synthesis of the different kinds of effects of the barriers on the acquisition of information are outlined in Table 58 and the effects on the research project are outlined in Table 59. The comments to Table 58 and Table 59 follow after Table 60.

The codes for Table 58 are:
dnk = do not know, not able to respond
0 = not applicable, do not experience the barrier
1 = no effect
2 = delays the acquisition of information
3 = increases effort required
4 = increases cost
5 = eliminates accessibility/usability

The codes for Table 59 are:
dnk = do not know, not able to respond
0 = not applicable, do not experience the barrier
1 = no effect
2 = increases effort required
3 = increases cost
4 = delays the project
5 = decreases the quality of the project.

Table 58: Synthesis of the kind of effects on the acquisition of information for the eight barriers measured by formula

Name of barrier	KIND OF EFFECT ON THE ACQUISITION OF INFORMATION dnk	0	1	2	3	4	5
Barrrier of information scarcity	0,0	36,7	0,0	1,7	40,0	3,3	18,3
Barrier of inferior information quality	0,0	25,0	8,3	10,0	50,0	0,0	6,7
Barrier of gaps in the collection	0,0	3,3	0,0	35,0	46,7	6,7	8,3
Barrier of obsolete and surplus publications in the LIS	1,7	65,0	10,0	5,0	16,7	0,0	1,6
Foreign language barrier	1,7	18,3	0,0	0,0	13,3	1,7	65,0
Barrier of inadequate subject-indexing level	0,0	68,4	3,3	0,0	23,3	0,0	5,0
Barrier of information congestion	0,0	48,3	0,0	6,7	40,0	1,7	3,3
Barrier of processing delays	0,0	5,0	0,0	13,3	45,0	3,3	33,4
Lowest reading	1,7	3,3	0,0	0,0	13,3	0,0	1,6
Highest reading	1,7	68,4	10,0	35,0	50,0	6,7	65,0
Average reading	1,7	33,8	7,2	12,0	34,4	3,3	17,7

Table 59: Synthesis of the kind of effects on the research project for the eight barriers measured by formula

Name of barrier	KIND OF EFFECT ON THE RESEARCH PROJECT dnk	0	1	2	3	4	5
Barrrier of information scarcity	0,0	36,7	0,0	28,3	1,7	10,0	23,3
Barrier of inferior information quality	0,0	25,0	8,3	53,4	0,0	8,3	5,0
Barrier of gaps in the collection	0,0	3,3	6,7	28,3	3,3	46,7	11,7
Barrier of obsolete and surplus publications in the LIS	1,6	65,0	16,7	11,7	0,0	0,0	5,0
Foreign language barrier	5,0	18,3	3,3	11,7	3,3	1,7	56,7
Barrier of inadequate subject-indexing level	0,0	68,4	5,0	15,0	1,7	6,6	3,3
Barrier of inf. congestion	0,0	48,3	3,3	25,0	1,7	15,0	6,7
Barrier of processing delays	0,0	5,0	1,7	28,3	6,7	30,0	28,3
Lowest reading	0,0	3,3	0,0	11,7	0,0	0,0	3,3
Highest reading	5,0	68,4	16,7	53,4	6,7	46,7	56,7
Average reading	3,3	33,8	6,4	25,2	3,0	16,9	17,5

As a supplement to the extent of the 'no effects' as presented in Table 57, the analysis of the most common effect for the barriers measured by formula is revealing. The following codes are used in Table 60 to represent the most frequently indicated response options of effect:
1 = increases effort required
2 = eliminates accessibility to information
3 = delays the project
4 = decreases the quality of the project.

Table 60: Frequency of the most common effect on the acquisition of information and on the research project for the eight barriers measured by formula

Name of barrier	MOST COMMON EFFECT (%) EFFECT ON THE ACQUISITION OF INFORMATION	EFFECT ON RESEARCH PROJECT
Barrier of inadequate subject-indexing level	1 (23,3 %)	1 (15,0 %)
Barrier of information congestion	1 (40,0 %)	1 (25,0 %)
Barrier of information scarcity	1 (40,0 %)	1 (28,3 %)
Barrier of obsolete and surplus publications in the LIS	1 (47,6 %)	1 (33,3 %)
Barrier of inferior information quality	1 (50,0 %)	1 (53,4 %)
Barrier of processing delays	1 (45,0 %)	3 (30,0 %)
Barrier of gaps in the collection	1 (46,7 %)	3 (46,7 %)
Foreign language barrier	2 (65,0 %)	4 (56,7 %)

The most frequent effect of barriers, for both the effect on the acquisition of information and on the research project, is 'increases effort required' (codes 2 and 3 respectively). At first glance this might be

interpreted as an indication that the dominating effects of barriers are not serious. However, in Table 59 the incidences for code 5 for some of the barriers are high, indicating that the effects of barriers can decrease the quality of research. Furthermore it must be remembered that ineffective LIS facilities and services are not used by the researcher, e.g. as recorded in Table 5 page 57 (of the target group, 51,7 % never used the subject catalogue, 38,1 never consulted their subject specialist, 41,7 % never consulted journals on display). Had the responses of these researchers been included, the effects would have been more serious. The message that again emerges here is that barriers do have effects, even though most of them might appear to only cause an increase in effort.

6.1.2.3 Synthesis and interpretation of the collected data on the trend of barriers

While it is obvious that the most serious barriers as indicated in 5.24 should be attended to first, the trend of the barrier is an added indicator, because a barrier with a decreasing trend does not deserve the same priority for being removed as does a barrier with an increasing trend. In Table 61 the percentage respondents are summarized as presented in section 5.2.2; Table 18 in 5.6.2.3; Table 23 in 5.7.2.3; Table 28 in 5.10.2.3; Table 33 in 5.11.2.4; Table 37 in 5.12.2.4; section 5.14.2.3; and Table 45 in 5.19.2.3. The responses are indicated as percentages of the target group.

Code 0 = did not experience the barrier or could not give a response
Code 1 = decreasing trend
Code 2 = constant trend
Code 3 = increasing trend

Table 61: Synthesis of the trend of the barriers measured by formula

Name of barrier	TREND OF THE BARRIER 0	1	2	3
Barrier of information scarcity	2,6	23,7	55,3	18,4
Barrier of inferior information quality:				
-repetitive information	4,7	13,9	60,5	20,9
-inaccurate, out of date	9,8	9,8	58,5	21,9
-from inferior research	9,8	12,2	56,1	21,9
Barrier of gaps in the collection:				
-monographs	25,0	15,0	40,0	20,0
-journals	18,4	15,0	48,3	18,3
-abstract and index journals	96,7	0,0	3,3	0,0
-reference tools	85,0	0,0	15,0	0,0
-foreign language publications	76,8	1,6	20,0	1,6
Barrier of obsolete and surplus publications in the LIS	68,3	3,3	16,7	11,7
Foreign language barrier	21,7	6,7	63,3	8,3
Barrier of inadequate subject-indexing level (subject catalogue)	68,4	5,0	23,3	3,3
Barrier of information congestion	48,3	0,0	10,0	41,7
Processing delays:				
-new monographs on order	28,3	1,7	65,0	5,0
-new journals on order	73,3	0,0	26,7	0,0
-requests for information	46,7	0,0	53,3	0,0
-loans from the own LIS	28,3	0,0	71,7	0,0
-interloans other LIS in RSA	18,3	1,7	80,0	0,0
-interloans overseas LIS	46,7	0,0	53,3	0,0

It is thus obvious that the most frequently indicated trend is (Code 2), the most obvious exception being the barrier of information congestion, with an increasing trend indicated by 41,7 % of the respondents. As the difference between the percentage of the code 2 and the code 3 responses is, except for the above example, so large, it does appear that the respondents are sure of their responses and that an increasing trend in barriers is not expected. A comparison between the Code 3 (increasing) and the Code 1 responses (decreasing) clearly shows that the percentage responses for the increasing code are higher than the decreasing code for 9 barriers, equal to it for seven barriers, and lower for only three barriers. Thus, although the most frequent trend is considered as constant, more respondents supported an increasing trend than a decreasing trend. This means firstly, that the target group does not expect the seriousness of barriers to decrease or increase, i.e. that barriers will remain, and secondly, that more respondents who do not think that the trend will remain constant are of the opinion that the seriousness of barriers will increase rather than decrease. The implications for the LIS are obvious.

6.1.3 Synthesis and interpretation of additional collected data

In addition to the questionnaire, several sources of additional data were generated during the course of the project. These sources, which should also be analysed for their relevance to the project, are: the comments made by the sixteen researchers approached by diary method of identifying barriers (Appendix 5 on page 188); the barriers identified by the thirteen managers of LIS (Appendix 6 on page 189); the thirteen researchers participating in the pilot study (Appendix 7 on page 194); the 364 comments sub-

mitted by 57 researchers of the target group at the end of the questionnaire interview (Appendix 9 on page 198); and the barriers experienced by the compilor in getting access to published information, as announced in section 1.1.2.5 on page 14 and as summarized in Appendix 10 on page 205.

From these sources about 560 comments were collected which briefly convey the following message:

- Researchers are exposed to a wide variety of barriers, ranging from barriers inherent in information and publications to the systems barriers in the LIS.
- Researchers are exposed different barriers of varying seriousness, ranging from 'inconveniences' or 'irritations' to truly serious barriers such as the barrier of gaps in the collection.
- The high number of barriers that fall under the supporting functions of the LIS, i.e. management, staff, procedures, rules and regulations, is unexpected and revealing. Most of these barriers can be accommodated under the barrier of unhelpful LIS procedures, rules and regulations. In the responses of the pilot study (Appendix 7 on page 194), and at the end of the interview (Appendix 9 on page 198), this barrier ranked as the most frequently mentioned barrier, drawing 92 of the 388 comments. Admittedly, this barrier is composed of many different aspects, some of them minor, but the importance of this barrier should not be underestimated. Nor should the cumulative effect of the various aspects that make up this barrier be ignored, for the reputation of the LIS to provide effective access to published information may be adversely affected, resulting in partial avoidence or even non-use. As revealed during the interviews, the widespread practise of researchers to write or telephone their overseas colleagues for a publication, instead of going through the formal channels, might be an indication of the opinion they have of LIS capability or capacity to supply required publications within the required time.
- There seems to be a lack of communication between the LIS and the researcher, but also between the researcher and the LIS. Appendix 7 on page 194 is rich on examples.
- The responses collected from researchers by means of the diary method did not identify any of the more serious barriers. Together with the data collected in response to question 6.2 (Are there any barriers that reduce your use of the information service in your organization?), the responses give the impression that researchers are not aware of the more serious barriers and of more barriers, or that they accept barriers as part of the price to pay for access to published information.
- Managers of LIS are exposed to many external factors, not only as far as information is concerned, but also to issues which indirectly affect their facilities and services to the researcher (Appendix 6 on page 189).

To summarize, it is clear that access to published information is impeded by many barriers.

6.1.4 Synthesis of barriers according to origin in the cycle of published information in research

In 1.1.1.3 on page 11 it was stated that it appears that the LIS is vulnerable to barriers from the other two components of the cycle of published information for research (Figure 2 page 8). At the end of Chapter 2 on pages 47 and 48 the 51 barriers identified were categorized according to their origin in the information cycle, i.e. 21 barriers in the publishing of information, 18 barriers in the LIS, and 12 barriers

in the researcher (Figure 2 page 8). In section 6.1.1.1, page 146 and 147, the barriers for which the seriousness was determined were categorized according to LIS barriers and barriers originating with the publisher and the researcher. The distribution in these two arrangements shows that the LIS is exposed to and unavoidably incorporates barriers from the other two components of the information cycle. The barriers pertaining to the quality of information are a good example, for except for applying strict selection to ensure that inferior information is not taken into the LIS collection, the LIS is helpless in curbing the production of such information or to veto a recommendation from a researcher that such a publication be acquired for the LIS. Thus inferior information enters the LIS and is passed onto the researcher.

6.2 EVALUATION OF THE RESEARCH METHOD

The methods selected should be evaluated to determine whether or not they were suited to attain the aims of the project, namely to identify barriers and to determine the seriousness of the more important barriers. The following methods used should be examined for suitability: Method of identifying barriers, the method of selecting the barriers to be measured, the method of measuring barriers, the currency of the collected data, the reliability of the collected data, and also the representativeness and applicability of the collected data to other disciplines and organizations.

6.2.1 Method of identifying barriers

Barriers were identified from a survey of the literature; by sixteen researchers with the aid of the diary method; by thirteen managers of LIS; by correspondence with thirteen overseas organizations; from personal experience; by thirteen researchers during the pilot study for testing the draft questionnaire, and by sixty researchers participating in the interview questionnaire.

It is striking and revealing, but supportive of the project, that these different sources identified such divergent categories of barriers. While the literature identified barriers in all three components of the information cycle, managers of the LIS, as can be expected, primarily identified operational barriers, and also barriers which researchers should have, but failed to identify e.g. the barrier of inadequate subject-indexing level, or the barrier of obsolete and surplus publications in the LIS. Although it is usually the manager and not the user who makes recommendations for an improved service (White, 1979:81) (possibly because of a lack of communication channels available to the researcher), the 16 researchers approached for recording the barriers they encounter could only identify relatively few and also mainly minor barriers (Appendix 5 on page 188). Thus while the diary method for identifying barriers did not identify as many barriers as expected, it had the benefit of revealing that the target group is largely ignorant of barriers. This is confirmed by the responses to question 6.2 at the start of the interview when only a few barriers and no serious barriers, as listed in section 4.9 on page 59 and 60, were identified as causing a decrease in the use of the LIS. In contrast, at the end of the interviews the same respondents on their own initiative were able to identify 364 barrier-related comments (Appendix 9 on page 198).

By identifying barriers from supplementary and complementary sources, the method selected for identifying barriers achieved adequate coverage

for the purpose of the project in spite of the disappointing results attained by the diary method.

6.2.2 Number and selection of barriers measured for seriousness

Of the initially identified 51 barriers, only 31 barriers or aspects of barriers or combinations of barriers were measured because of restrictions imposed on the length of the interview. While the most important barriers were selected for measuring, the project would have achieved added value if all the identified barriers had been measured.

Of the barriers excluded from measurement, the barrier of unhelpful LIS procedures, rules and regulations proved to be the most obvious omission. Although the barrier is composed of many aspects which make it cumbersome to measure for seriousness, with the benefit of hindsight, one or two of its aspects could have been included. As indicated in 6.1.4 on page 159, the frequency with which this barrier was mentioned in response to question 21 at the end of the interview was unexpected (Appendix 9 on page 198). Nevertheless, this barrier and the other barriers for which the seriousness were not determined, appear to be neither as serious nor as frequent as the barriers which were included in the questionnaire, and also appear to be more readily removable without requiring a measured indication of their seriousness, or lenghty investigations. Their omission, though intentional, does not detract from the benefit of the study.

6.2.3 Method of measuring the seriousness of barriers

Several methods were used to determine the seriousness of barriers:

- the formula s = f + e1 + e2 + t (where s = the sum of; f = frequency; e1 = effect of barrier on the acquisition of information; e2 = effect on the research project; t = trend of the barrier);
- whether a phenomenon was experienced or not, and if so, whether it presented a barrier or not;
- straightforward frequency counts for barriers which were difficult to measure.

To a certain extent the order of seriousness in which the barriers are arranged in 5.24, page 140 and 141 can, as discussed in section 6.1.1, be substantiated by reasoning and from personal experience. Thus for the wide application for which it was designed, the formula seems to have attained its purpose for indicating the seriousness of barriers as perceived by the 60 researchers. However the formula is not yet sufficiently tested and further refining is recommended before it can be accepted by LIS management as an instument for measuring the seriousness of barriers. Such testing could e.g. include the combining of the effectsof 'increased effort' and 'increased cost' in Figure 5 page 20.

The project would probably have benefited if the formula had been used to measure more or all the barriers that could be measured by formula, using the other methods only for those barriers that could not be measured by formula. Nevertheless the combination of Tables 54 and 55 into Table 56 to create one sequence for the percentage of the target group experiencing the barriers, irrespective of the method of measuring used, partly compensates for the restriction imposed because of the limited interview time available.

Based on straightforward frequency counts, the other two methods of measuring seriousness are also effective.

6.2.4 Currency of the collected data

The interviews with the target group were conducted during July and August 1985 and the question can be asked whether the collected data can still be considered as current, i.e. is the data still reliable?

As concerns the data collected from the target group, the answer to this question is yes for the following reasons:

- Barriers seem to be permanent. The trend of barriers as indicated in the project remains dominantly constant. Thus in the absence of the introduction of new barrier-free access to information methods, it is likely that the same barriers are still active.
- Considering the extent of the various barriers, the continuing increase in publications, increasing specialization, the interdisciplinary and multidisciplinary nature of research, new economic and political boycotts, and decreasing budgets, it may be assumed, in the absence of remedial procedures, that the effective access to published information for research will not improve, but that researchers might even experience more barriers and possibly experience them more frequently.

For these reasons the currency of the data collected from the target group remains relevant and valid, at least until some effort has been made either to reduce or to remove the barriers.

The currency of the data collected from the literature cannot be readily ascertained. In the absence of current data, the extent of barriers had to be gleaned from use and user studies conducted during the 1960s and 1970s. In isolated instances, some repeated use and user studies allow for a comparison, but while these are not conclusive, they do, together with personal experience, indicate that the extent of barriers, if it has not increased, has certainly remained constant. Thus, in the absence of other indicators, the data collected from the literature can also be taken as reasonably indicative of the present situation.

6.2.5 Reliability of data collected from the target group

The collection of the data by means of the interview questionnaire, as opposed to other methods, eliminated the disadvantages outlined in 1.2.4.2. The reliability of the data is essentially dependent on the objective and honest responses of the target group. The calculations and editing programs, executed by computer, ensured accurate recording of the responses. The data thus are as accurate as collected from the target group.

6.2.6 Representativeness and applicability of the collected data

The data were collected from a target group selected by means of purposive sampling. Based on subjective opinion and experience, this method was preferred to random sampling because it was considered more important for the project to collect data from authoritative rather than representative respondents. While purposive sampling assured informed, knowledgeable and authoritative opinions, it cannot be assumed that the collected data are representative of, for example, the data collected from other researchers in the same disciplines, other disciplines or other organizations. However, as reported in the literature, the seriousness of barriers does not seem to differ widely amongst different types of disciplines, which indicated that some generalization of the data collected from the target group is permitted.

The data collected from the literature are also considered not to be representative of the situation concerning barriers as experienced by users of published information. The lack of contributions in the literature on details of the frequency, effects and seriouness of barriers was a disadvantage and perhaps the most unexpected finding of the project. The wide variations in methods used and in the populations studied, make it difficult to obtain representative data, and comparisons or generalizations between the data collected from the literature and that collected from the target group were difficult to make.

Strictly speaking, representativeness and applicability of the collected data is not essential, for each LIS operates in an unique environment and only broad indicators of the seriousness of barriers were required for this exploratory project. As barriers are not germane to one discipline, to one organization or to one type of LIS, it is more important to develop a general method of identifying and of measuring the seriousness of barriers.

6.3 POTENTIAL BENEFITS OF THE PROJECT

The potential benefits were the main reason for undertaking the project. The immediate benefits can be listed as follows:

- identification and listing of barriers;
- designing a method of measuring the seriousness of barriers;
- measuring the seriousness of the more important barriers;
- compiling a list of barriers in order of seriousness which suggests the order in which they should be either removed or reduced (as listed in section 5.24 and section 6.1.1 on page 146 and 147.

An ultimate benefit of the project would be a situation where the advantages of the present LIS are retained and the identified barriers are removed or at least reduced.

The following additional six benefits should also be listed:

- **Wider applicability of the formula s = f + e1 + e2 + t**
  After further testing, the formula can be refined so that it becomes an instrument for managers of LIS to use for evaluating their services. Outside the LIS environment this formula could also be applied for determining the seriousness of a problem, for its seriousness is commonly compiled from frequency and effect, the trend indicating the predicted seriousness.

- **Prone position of the LIS in the information cycle**
  The project reveals the extent to which the LIS is exposed to and incorporates barriers from the other participants in the information cycle, barriers over which it has no or only very little control.

- **The LIS contains barriers**
  In addition to the barriers the LIS incorporates from its outside environment, the LIS, which promotes access to published information, was shown to generate barriers to the researcher.

- **Barrier studies can advance use and user studies**
  Use and user studies provide insight into the ways by means of which users gain access to information. Such studies are however mainly analytical, i.e. they do not contribute to an understanding of the underlying reasons for user behaviour (Hills, 1972:12) and do not indicate the barriers which cause certain user behaviour. By supplementing use and user studies with barrier studies, or even better, by concentrating on

the barriers experienced in gaining access to information, the analytical insight of the use and user studies can be supplemented or be replaced with a better understanding of the underlying reasons for information-handling patterns, and thus enhance the possibilities of remedial action.

- **Barrier studies as an additional method of evaluating the LIS**
  An effective way of improving access to published information is by constant evaluation of the success rate, by determining the causes for the failures, and by taking remedial action. However, as indicated in 1.2.2 on page 14 and 15, existing evaluating methods cannot indicate the full extent of delays, frustrations, efforts and costs, nor the frequency, effects and trends of barriers involved in achieving the success rate. The measuring of barriers, however, provides a more detailed evaluation tool that specifically identifies the nature and extent of the barrier. It can thus be applied additionally or instead of existing methods of evaluating the LIS.

- **Contribution to the theory of information flow**
  The task of the theory of scientific information is to investigate the process of the flow of information, to identify failures in this process and to indicate means for eliminating such failures (Dembovska, 1968:113). This project contributes to the understanding of information flow by identifying barriers, by developing a method of measuring barriers, and by establishing the seriousness of barriers.

6.4 CONCLUSIONS

- The published literature does not reflect the nature, extent, effects, trend, nor the seriousness of barriers as experienced by the researcher.
- Barriers are inherent in all three participants of the cycle of published information in research.
- The LIS is exposed to and incorporates external barriers.
- The LIS also generates barriers.
- The researchers covered by the project experience barriers in gaining access to published information.
- Barriers are detrimental to the acquisition of information and to the research process.
- The seriousness of barriers is considered to remain constant.
- Researchers are not sufficiently aware of barriers.
- Researchers seem to accept barriers as an integral part of the research process.
- Researchers do not use the LIS as frequently and as intensely as they could or should.
- Researchers are largely ignorant of effective methods of information sources and the effective method of handling information and documentation.
- The LIS seems to communicate ineffectively and is largely ignorant of the information needs and barriers experienced. Similarly, researchers do not seem to communicate to the LIS their information needs and the problems which they encounter in obtaining access to published information.
- The LIS and its librarians are seen by researchers as administrators and managers of publications, and not as managers of the contents of the publications and as part of the research process.
- In Chapter 5 a comparison was made between the seriousness of the barriers as identified in the literature and as determined by the target group. Where comparisons could be made, the seriousness was higher for the target group.

6.5 RECOMMENDATIONS

The most important purpose of the project was to determine the seriousness of the barriers so that they can be removed for improved information flow. The main recommendation is:

Ways should be researched to remove barriers
The collected data provided an overview of the seriousness of barriers encountered by a group of 60 researchers. As it is very likely that other researchers in other organizations also experience barriers in gaining access to published information, their barriers should also be identified so that they can be removed or at least reduced.

In addition the following broad recommendations (which go beyond the attention given to individual barriers) can be made:

The quality of contributions to the literature should be improved
Inferior and obsolescent information should not be allowed to enter the information cycle. When evaluating scholarly journals, it is revealing that editors rate contribution to knowledge as the most important criterion of evaluation (Ryan: 1982). Unfortunately not all authors seem to agree. While the production and use of inferior and obsolescent information has a place as a start in the development of a science and in the development of the manpower of a nation, what is recommended is a reappraisal of the scientific process and its methods of communication so as preferably to eliminate inferior and obsolescent information or at least to not let it intermingle with potentially sound information.

Authors should assume more responsibility for the access and retrievability of their contributions to the literature
Traditionally authors and editors have assumed little responsibility for the retrievability of their contributions to the literature. They should however prepare their contributions with more sensitivity to subsequent access and retrieval. This would include, e.g. better indexes, better index and abstract journals, and also the greater application of international standards for presenting publications. The LIS can assist in this effort.

Unclear terminology and unclear LIS functions
The dichotomy between the diverse interpretations of the term 'information' as 'process' and as 'contents' is important to the LIS. If the LIS interpret information as a process, and gear their activities to handle the media but not the contents, and researchers interpret information as contents for decision making, as they surely do, then a potential source of misunderstanding and conflicting activities arises, with little hope of information needs being met. While it is recommended that the LIS become a more dynamic partner in the research activity, supporting the research activity with all its functions, the LIS should remain active for research and not in the research efforts of the researchers it serves, i.e. it should not be in competition with research (Buzas, 1960:93). It is, therefore, recommended that the LIS which serves the needs of researchers looks again at its mission.

LIS should become more involved in the information cycle for published research
Instead of incorporating barriers from the other two components of the information cycle, the LIS should not regard all of these barriers as fixed parameters, but should and can become more involved during the information-generation stage. By preactive action and in co-operation with the participants of the information cyle, at least some of the barriers can be

removed. This would include efforts by the LIS to become a more active partner in the research process.

In its efforts to become an integral part of the information cycle the following recommendations are also made:

- In its efforts to design a relatively barrier-free LIS, it is imperative that the LIS becomes aware of all barriers and the effects these might have. The LIS should therefore become more barrier-conscious.
- In its efforts to design a relatively barrier-free LIS, it is recommended that researchers become more involved in the design of LIS facilities and services. It is, after all, for them that the LIS was established.
- The LIS should become more active in the selection and weeding of the collection and in the use of the information contained in the collection.
- The LIS should become more involved in assisting researchers with the handling of their personal information and documentation systems which are generated to support research.
- Information is part of the information process. LIS personnel are inclined to handle a request for information as a single transaction, whereas it is part of the information process and the information cycle and has wider repercussions.
- Although the report deals only with published sources of information, i.e. the formal sources, the LIS should, for the following six reasons, take a constructive interest in the organization of the informal sources of information used by the researcher:
  - The informal sources constitute an important source of information (Neubauer, 1971:12; Allen, 1976). Traditional document-based libraries are irrelevant to the most pressing information problems (Slater, 1988:235-236).
  - The organization of the informal sources supplements the formal information sources so as to provide a more complete service.
  - A large part of the information conveyed by means of the informal sources is acquired from formal information sources, i.e. it originates from the sources held by the LIS. The informal and the formal sources are thus supplementary and complentary.
  - Informal sources have inherent barriers such as reliability, lack of permanence and they do not present an scientifically based source that can be quoted. Organizing informal sources into a more formal source can add credibility and authority to the informal sources.
  - The informal sources seem to be more heavily used in the organizations where researchers experience more barriers with the LIS. Becoming involved in the informal sources will surely reveal deficiencies in the formal information sources.
  - The use made of, and the reasons for consulting the informal information sources, can serve as an additional indicator of information needs. After studying these needs, the required services could be introduced.

Unfortunately organizational and policy statements of LIS have up to now favoured, if not overemphasized, the formal sources of information, possibly because they are more visible and manageable than the informal sources. Yet the informal information sources can be effectively managed and interpersonal contact between researchers can be improved (Allen & Cooney, 1973:51; Allen, 1976:page 2-9; Lancaster, 1979:310-311). Figure 9, adapted from the diagram used by Saracevic (1975:337), outlines such a suggested approach.

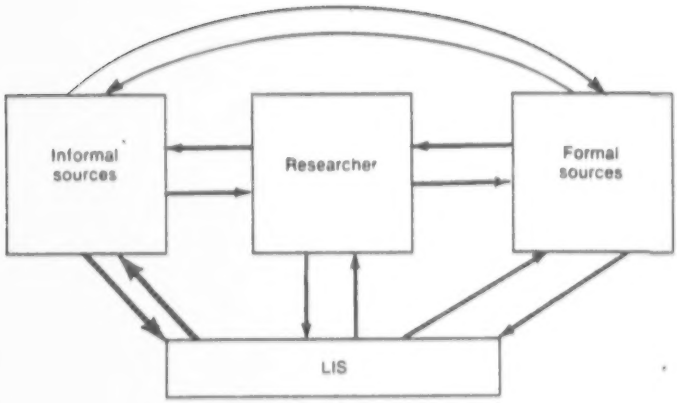

Figure 9: Proposed LIS involvement in organizing informal sources of information

One way in which interpersonal contact between researchers can be stimulated is by formalizing and by increasing the exchange of research information. The target group demonstrated that they were not always aware of research projects being conducted by other organizations on their research topic. It is thus recommended that registers of experts in the field and registers of ongoing and completed investigations be compiled. As an experiment a register of in-house investigations in librarianship was compiled (Haag, 1986).

Improved quality of staff required

The findings imply and suggest that concerned managers of the LIS should examine recruitment, education and training (curricula), job design, staffing, and supervisory and organizational practices, procedures, rules and regulations, and should find solutions so as to remove or reduce barriers and strengthen performance (Webster 1987:79). The greatest need seems to be for improvement on the middle-management level.

Code of ethics required

The purposeful involvement of librarians and information specialists in removing barriers indirectly brings about a greater awareness of the research activity and greater professional involvement on a higher level than before. This calls for a code of ethics which could deal with, for example, confidentiality of research programmes, unbiased approach to information searches, and correctness of information supplied.

The removal of barriers is an ongoing process

While the identification, removal or reduction of barriers in a LIS should lead to improved access to published information, solutions cannot be permanent. The generating, processing, accessing, using, and storing of information is a continuously changing process which can result in new barriers. Thus, to retain optimum efficiency, the LIS should periodically identify, monitor, and attend to those barriers which are experienced by researchers.

Further research on the formula s = f + e1 + e2 + t required

The devised formula needs wider testing and refinement before it can be introduced as a management instrument for evaluating LIS.

Research projects on barriers should be undertaken

To acquire a better understanding of barriers, it is recommended that the following research project be undertaken:

- The relationship between barriers should be examined. Barriers seem to be related to other barriers by means of cause and effect, i.e. barriers are contributory, interrelated, or consequential. For example, the foreign language barrier has, as contributory barriers, the
  - ignorance of information sources barrier, i.e. researchers as shown by Wood (1967:125-126) and Ellen (1979:37), are generally not aware of the guides to translations which would assist them to overcome the barrier;
  - barrier of limited time, i.e. the researchers does not have enough time to find a published translation, or to tackle the translation himself, or to wait for a translation;
  - barrier of inadequate financial support, i.e. funding does not provide for translations, which can be expensive.

  A consequence of the foreign language barrier is the barrier of repetitive information and the barrier of unnecessary duplication of research.

  If the contributory barriers can be identified and removed, it is likely that the barrier , as well as its resultant barriers, will also be removed or reduced. Furthermore it is important to realize the relationship between barriers when removing or reducing them or when designing an information system. If, for example, the barrier of publishing delay is reduced by speeding up or eliminating the thorough refereeing process at the expense of information quality, the barrier of inferior information quality in new contributions will increase. Bever (1969:5) for example shows that preprints, designed for the rapid distribution of information and for reducing possible duplication of research, have been found to contain misleading information.

- For removing or reducing barriers a priority programme is required. First of all, the barriers should be categorized according to
  - barriers that cannot be removed,
  - barriers that can be removed by management by administrative procedures without lengthy investigations, e.g. unhelpful opening hours,
  - barriers that need research to determine whether, and, if so, how they can be removed.

  The last two categories should be presented in priority order. Thus it is recommended that a management priority programme be compiled for managers for attending to the barriers that can be removed or reduced by administrative means, and that a research priority programme is compiled for researchers and managers for attending to the barriers that require further research before they can be removed.

These ten recommendations round off the synthesis and interpretation of the data collected on barriers.

This report presents a gathering of identified barriers and their seriousness. Such a concentration of barriers might give the impression that existing LIS are incapable of providing adequate access to published information. This is not the intention of the project, as the overall picture of user satisfaction cannot and should not be derived solely from an identification of the barriers and the measurement of their seriousness. What is important is that the full extent of frequency, effects and the

trend of barriers is emphasized. Considering that Slater (1984b:203-204) mentions that of all work-related problems, information-related problems rank as the most serious problem, the seriousness of the problem cannot be overstated. Furthermore, the manager of the LIS can expect that, for the following reasons, the frequency, extent and the effect of external barriers on his LIS can increase:

- the continuing increase in publications;
- the increasing specialization of research on the one hand, and the increasing interdisciplinary and multidisciplinary research on the other;
- new economic pressures;
- pending economic and political boycotts;
- the increasing dependence of LIS on external information sources of data, technical expertise, bibliographic and current awareness services, selective dissemination of information services, citation indexes, and the consolidation and repackaging of information, all performed by people who are not LIS professionals.

In the research environment, LIS represent an important, if not the most important, source of published information. LIS are under professional obligation to support effectively the research activity by ensuring barrier-free access to published information. Should barriers in the LIS not be removed, researchers have two options: to continue conducting research whilst handicapped by those barriers outlined in this report, or to seek alternative information facilities and services. Both these options are, of course, not only detrimental to the research process, but constitute a threat to the justified continued existence of the LIS, and to librarianship as a profession. The choice of whether or not to meet their obligation by attending to the barriers identified in this project rests with the LIS.

APPENDIX 1: CHRONOLOGICAL OVERVIEW OF ARTICLES DEALING WITH BARRIERS

The type of barrier covered by the article, e.g. storage and retrieval, is indicated in brackets. No indication is provided for articles covering barriers active in several LIS functions.

Chamberlin 1959:1524 (storage and retrieval)
Lack of comprehensive means for retrieving information, particularly in peripheral fields; lack of accessibility to many publications; lack of translations; delay in publishing abstracts; uncertainty that abstract coverage is comprehensive; duplication of effort and frustration in literature search.

Sheel, P. 1959:589-590 (literature searches)
Inadequacy of coverage and the delays in reporting literature in secondary publication; language problem; postal delays.

United States of America. President's Science Advisory Committee. 1963 (information transfer)
Authors should prepare their papers with more sensitive regard for subsequent dissemination; eliminate unnecessary publications; improve quality of scientific books; higher reviewing quality; exploit modern psychological insight into communication; improve language command of languages; improve command of handling information; provide technical assistance for the scientist to handle information; improve the information handling system (indexes, abstracts); central depository for dissemination and retrieval of information; more and better information centres for dissemination and retrieval of information; improve mechanization; citation indexes; enhance copatibility amongst information systems; government support for non-government technical publications.

Gerryts, E.D. 1966:9-11 (repography for documentation)
Delay in publication; preservation; impermanence of the record; retrieval deficiencies; availability delay.

Mount, E. 1966:576-577 (the user in the reference situation)
Lack of knowledge of the depth and quality of the collection; lack of knowledge of available reference tools; lack of vocabulary used by a particular reference tool; does not willingly reveal the reason for needing information; has not really decided what is really required; is not at ease in asking questions; cannot reveal true question because of its sensitive nature; dislikes reference staff (or vice versa); lack of confidence in the ability of the reference staff.

Meyer-Uhlenried, K.H. 1967:225-236
Publishing delay; layout and contents of publications not presented according to international standards.

Crum, N.J. 1969:273-274 (librarian - customer relationship)
Physical barrier - the customer is out of his environment in the library; personality barriers; communication barriers (individual differences in knowledge, use of language, advanced vocabularies of scientists, lack of knowledge on what are the proper questions to ask); professional and psychological barriers (approaching library might be interpreted as a sign of ignorance).

Polushkin, V.A. & Zhdanova, G.S. 1970:1
Unawareness barrier (ignorance of existing information); communication barrier (failure to acquire the required publication); interlanguage barrier

(document cannot be read because it is in an unfamiliar language); intra-language barrier (failure to assimilate the contents of a document as it is incorrectly labeled as irrelevant).

Engelbert, H. 1971:401-402
Time barrier (decreasing accessibility of information after ten years); political-ideological barrier (restrictions on the access to information from antagonistic regimes); ownership barrier (access restrictions); judicial barriers (legal restrictions to access); financial barrier (restricted funds); terminology barrier (differentiating terminology with decreasing comprehension); ignorance barrier (user only consults the information system if he suspects it holds the required information); access barrier (the existing information cannot be acquired); language barrier (information is in a language the user cannot read); user does not realize the potential value of a document and ignores relevant information; due to lack of time the user cannot process the information.

Basu, R.N. 1972:30-33
Growth rate of information; rehash of already known information published; polluted information (propaganda, redundat information); terminological explosion, leading to etymological anarchy; time delays in publishing and retrospective information searches; language barrier; increase in cost of communications, publications and services; slow method of communication.

University of the Witwatersrand. 1971a:3
Delay in ordering and processing new books and journals; inadequate bookstock; inefficient service; missing publications; interlending delays; inacequate standard of staff (subject knowledge and training); inadequate training on how to use the library and its resources; dispersal of library services; unhelpful procedures, e.g. long binding period for periodicals and unavailability during binding.

Duncan, W.J. 1972:280-285 (barriers in the knowledge utilization process in management and organization)
Epistemological barriers:
Factors which influence development of intersubjective knowledge.
Interpersonal barriers:
Varying expectations and values; real and imagined discrepancies in role perceptions; communicator relationship; status problems; language problem (lack of consistent terminology).
Barriers in the external and internal environments of the organization:
Ecoromic-political philosophies; general economic conditions; interorganizational environment; resistance to new ideas.

Anderla, G. 1973:27-32
Exuberant growth of information; anachronistic organization and management of the services for the collection, processing and redistribution of information.

Zastrau, H.O.K. 1973:2-14
Information explosion; low percentage of new information published; delay in reporting new information; delay in processing acquisitions; foreign languages; increasing proportion of obsolescent information in the system; insufficiently trained staff; hesitancy of the user to delegate information searches and problems; antiquated methods of handling, processing information sources; lack of assistance to users to gather the required information.

Bunge, C.A. 1974:76-77
Complexity of the library; ignorance of available information facilities and services; lack of ability of user to express an information need clearly; language barrier; barrier of defensiveness (user afraid to ask for help); barrier of contrary purposes (user wants the librarian to do his work for him, librarian wants user to learn how to do his own work.

Engelbert, H. 1974a:51-54; 1974b:47-51
Political ideological information barrier; ownership barrier; judicial barrier; time barrier (decreasing access to information after a certain time); effectiveness barrier (elimination of irrelevant documents); financial barrier; terminology barrier; foreign language barrier; receptivity barrier (caused by too much information); suspected existence of information barrier; resonance barrier (personal habits, opinions, values, associations with certain school or philosophy); access barrier (existing information cannot be obtained); transfer barrier in the system (redundant information supplied).

Gray, J. & Perry, B. 1975:22-23 (problem of information growth)
Increase in cross-disciplinary research demands the creation of new cross-disciplinary services or the learning of how to use disciplinary services in a cross-disciplinary manner; language dispersal; scatter of different outlets and media in which information is released; continuing, perhaps even growing, unevenness of quality of information.

Saracevic, T. 1975:333
Overabundance of information at the source; scarcity of relevant information at the destination; many solutions to barriers based on new technology result in new barriers, inposing new levels of complexity and difficulty for the user.

Engelbert, H. 1976:2-7
Interlingual (foreign language) barrier; innerlingual (terminology) barrier.

Saracevic, T.; Shaw, W.M. & Kantor, P.B. 1977
Access barriers caused by acquisition policy, circulating policy, library operations and by the users.

Wilkin, A. 1977:286-290
Interpersonal barriers:
Synchronization of activities of user and information service; difficulty of user in expressing his need; accessibility of information source.
Intraorganizational barriers:
Inhibiting effect of status hierarchy on information flow; informal networks not strongly developed; differing terminology; geographical separation.

Haag, D.E. 1978:17-36
Availability barrier; barrier of inadequate financial support; ownership barrier; political-ideological barrier; barrier of geographical isolation; suspected existence barrier (only information expected to exist searched for); terminology barrier; level of recognition barrier (relevant information not recognized due to differing level of complexity); time barrier; congestion of available information barrier; dispersal of information barrier; barrier of ignorance for basic sources of information and services; delay in publishing abstracts and indexes; barrier of duplication and replication (of research); foreign language barrier; barrier of weak informa-

tion searching strategy; barrier of inadequate and difficult to use library facilities and services.

Lancaster, F.W. & Smith, L.C. 1978:380-388
Growth of information; increasing dispersal and fragmentation; increasing costs; dissatisfaction with science journal as a means of disseminating research results; increasingly less and more expensive publishing space for publishing research results; proliferation in the number of languages in which research results are published; greater need for repackaged research results.

Rowley, J.E. & Turner, C.M.D. 1978:298-353 (barriers to dissemination)
Foreign language barrier; copyright; microforms (absence of standards); quality control lacking; bibliographic control poor; user resistance: insufficient bibliographic detail about the publication.

Bernier, C.L. & Yerkey, A.N. 1979
Reading overload (too much to read); lack of cogency (lack of action after having read); functional obsolescence (through greater specialization loose track of other developments); popularization (standardization of nomenclature and terminology); drowning in irrelevant paper; lack of knowledge of who knows what; translations from other languages; adequate computer use; video tape service (underutilization); microfilm services; knowledge of information system.

Blake, B., Morkham, T. & Skinner, A. 1980:171-172
Anxiety created by the wealth of information received; difficulty to trace procedural information; desire to share problems, experiences and ideas with others engaged in similar work; frustrated attempts to get hold of particular information at short notice; lack of up-to-date reference material and of familiarity with the range of potential useful sources.

Meijer, J.G. 1980:32-77
Inadequate indexing of certain publications; gaps in the collection; non-publishing of reports; weak information searching strategy; ignorance for information services; difficult to use catalogue; lack of micro-indexing; lack of translation facilities.

Cochrane, P.A. 1981:113 (information transfer)
Language barrier; censorship; diversity in the features and languages of online retrieval systems; proliferation of data bases; need for intensive training on data bases; fees imposed for using information services; interpersonal barriers; communication barriers caused by equipment inadequacies.

Gilbert, J. & Fjällbrant, N. 1981
Problems user experience because authors failed to adhere to the "precepts of good practice" in writing the paper:
Failure to indicate the constraints under which the research was done; inadequate explanation of experimental procedure; incomplete data, results cannot be repeated; not showing how the conclusions were reached; providing inadequate measures of validity and reliability of results; including inaccurate references; using unnecessary complex and technical language; presenting results and conclusions in an inappropriate mathematical form; failing to indicate the potential readership; not including background against which the research was done; failing to suggest possible uses for the results; reporting only successful research results, i.e., that which supports the hypothesis; raising issues without presenting new insight into them.

Problems users of research results experience because of editorial problems:
Span of time between acceptance of paper and its appearance in print; editors are reactive, i.e. consider only what is presented to them, rather than soliciting articles of strategic interest; unnecessary republishing of the same paper; difficult to identify the progenitor of the work in multiple authorship; articles often lack apparent development (ideas if pursued, are presented in other journals); "house style" of journal might impose constraints on author; only certain types of research are thought to be "proper"; journals tend to favour a certain type of article e.g. high prestige journals seem to prefer general or review articles; editorial function seems to be uneven, e.g. referees are recruited in an unsystematic manner.

Kirouac, G. 1981:119 (barriers to information transfer in industry)
Difficulty or inability to accurately define real information needs; need basic knowledge to screen out the irrelevant, analyze, assess and adapt the information; lack of financial, material and human resources to implement technology; resistance to change; social-economic factors (inflation, polution, energy crises, supplies and material depletion, social and labour legislation).

Lindemann, T.L. 1981:120 (barriers to information transfer in developing countries)
Lack of acceptance that information and documentation are essential to industrial activity; lack of understanding by information scientists of the objectives of the organization.

Ljungberg, S. 1981:115-117
Place and status of the information service in the company structure.

McGarry, K.J. 1981:144-145 (barriers in information flow)
Censorship of information or its distortion by propaganda; lack of guiding users; classification schemes that no longer reflect the structure of modern knowledge or the interest of the user; indexing systems that are difficult to use; failure of librarians as mediator between document and user; ignorance of the user.

Taylor, D.C. 1982:109-110 (serials)
Proliferation of scholarly writing: reader not able to find all the relevant articles; scatter of literature; cost of subscriptions.

Nwagha, G.K.N. 1983:168
Shortage of funds; insufficient and unsatisfactory photocopying machinery; poor postal system; shortage of foreign exchange; inadequate union lists (monographs and periodicals); deployment of professional librarians.

Spero, J.E. 1983:68 (barriers to international information flow)
Discriminatory pricing of data transmission services; mandated use of national public data networks, eliminating the ability to meet specialized needs with a technically appropriate and cost-efficient communication link; denial of leased lives, or restrictions on their use; local content laws requiring the processing of data within the country of origin; restrictions on the import of equipment, spare parts, or software; emerging policies which can provide the basis for customer duties and value-added taxes.

Summers, S. et al. 1983:84 (barriers in the use of information)
Finding time to look for or to read information; getting information quickly enough; getting up-to-date information; understanding research reports and statistics; locating suitable sources; financial costs; lack of

qualified help to locate information; making information understood by others; resolving differences between reports; knowing how to use indexes.

Boon, J.A. 1984:87
Congestion of information; unsistematized method of producing and publishing of information, published in a variety of media and without regard for retrieval of contained information; the transient validity of information, the aging of information and its carrier; lack of quality filters in the production and retrieval of information.

Haag, D.E. 1984:214-218
Publishing delay; inferior quality of information; information congestion; information despersal; poor use of nonprint; inconsistent publication standards or the lack of standards; information termilonogy; information ownership; suspected existence of information barriers; weak information searching strategy; foreign language barrier; time constraints; geographical isolation; information delay in the library.

Mikhailov, A.I., Chernyi, A.I. & Gilarevskii, 1984:15-29
Interlanguage barrier (diversification of languages); intralanguage barrier (greater specialization leads to less understanding between the different fields); semiological barrier.

Raitt, D.I. 1984:16-18
Physical barriers, e.g. distance from source; political barriers; delay in publication; personal barriers of individuals (judgements, views, prejudices, emotions, values, personalities, job functions, cultural factors); semantic barriers, i.e. linguistic abilities; amount, rate and complexity of information received.

Langhein, J. 1985:239
Subjective information barriers:
Lack of education and training, willingness to learn, lack of insight into problems, influences of the spirit of the age, lack of time.
Objective information barriers:
Information congestion; ignorance of information facilities and services; lack of methods to gain insight into the potential value of information; access barriers (rules and regulations, user fees, opening hours); geographical distance from source; too high costs; too time consuming; uncertainty of success rate; lack of user friendliness.
Gaps in available primary information: Gaps in research, methods, theory and practice, especially in the overlapping on interdisciplinary topics; lack in co-operation, synopsis, syntheses; blocked problem vision (organizational blindness, narrow-mindedness).
Gaps in available primary information:
Lack of coverage, synopsis, conclusions.
Gaps in available tertiary information systems:
Current daily information (political, economic, cultural, production information); technical information.
Gaps in the co-ordination and storage of the differing information systems.

Kretschmer, F. 1986
Access barriers on microcarriers.

Kacena, B.J. 1987
Image of libraries and librarians; accessibility to information.

APPENDIX 2: DIARY FORM SENT TO SIXTEEN RESEARCHERS FOR IDENTIFYING BARRIERS

PLEASE DESCRIBE BRIEFLY ANY INCONVENIENCE OR PROBLEM EXPERIENCED IN IDENTIFYING, LOCATING OR USING PUBLISHED INFORMATION OR IN USING THE LIBRARY DURING THE NEXT 4 TO 6 WEEKS

PLEASE DESCRIBE BRIEFLY ANY BARRIERS EXPERIENCED IN THE PAST

Faculty or research field:

Period covered:

Name (will not be recorded):

APPENDIX 3: THIRTEEN ORGANIZATIONS APPROACHED BY CORRESPONDENCE FOR DETAILS ON BARRIERS

- International Council of Scientific Unions, Committee on Data for Science and Technology, Paris.
- Centre for Research on Utilization of Scientific Knowledge, Institute for Social Research. University of Michigan, Ann Arbor.
- Aslib, London.
- Librarianship School, Loughborough University.
- Centre for Information Science, City University, London.
- Department of Information Studies, University of Sheffield.
- Primary Communications Research Centre, University of Leicester.
- International Federation for Documentation (FID), Paris.
- American Society of Information Science (ASIS).
- British Library, London.
- Chemical Abstracts Services, Columbus, Ohio.
- International Nuclear Information System (INIS), Vienna.
- UNISIST. Division of Scientific and Technological Information and Documentation, Paris.

APPENDIX 4: QUESTIONNAIRE

The questionnaire starts on the next page. In the questionnaire, the application of the allocated codes is standardized as follows:

- Codes 1 and 2, e.g. in question 2.1, refers to *YES* and to *NO* responses respectively.
- Codes 0-7, e.g. questions 3.2 and 5.2, and codes 0-5, e.g. question 7.4.2, refer to the scales developed in 1.3.3.2, pages 17 and 18, for measuring extent, frequency or effect.
- Codes 1, 2, 3, and 4 indicate, in sequence, *YES NO YES NO*, e.g. question 10.3, where a response of 1 indicates that the respondent does come across research results not published, code 2 that he has no experience of research results not published, code 3 that the research results not published constitute a barrier, and code 4 that they constitute no barrier.

QUESTIONNAIRE TO 60 RESEARCHERS

HUMAN SCIENCES RESEARCH COUNCIL. Unit for Library and Information Research. BIN-8
TOPIC: INFORMATION BARRIERS EXPERIENCED BY RESEARCHERS: THEIR IDENTIFICATION, MEASUREMENT, AND SERIOUSNESS.

| | | |

	At least once a week	once a month	once in 3 months	Less often	Never	
a	1	2	3	4	5	22
b	1	2	3	4	5	23
c	1	2	3	4	5	24

6.2 Are there any barriers that reduce your use of the information service in your organization? (NO = blank)

25
26
27
28
29
30
31
32

B PUBLISHED INFORMATION SOURCES

7 Selection of information sources

7.1 Who in your organization is primarily responsible for (a) preselecting (b) recommending (c) final approval for purchasing (1) monographs (2) journals (3) reference tools?

	Monogr.	Jnls.	Ref.	
Preselecting				33 34 35
Recommending				36 37 38
Final approval				39 40 41

0 = Do not know
1 = Another department
2 = Department head
3 = You
4 = Subject specialist
5 = Other information service staff _____
6 = The library committee
7 = Nobody
8 = Other _____

7.2 What percentage of new publications on your subject research topic can the subject specialist select? (no subject specialist = blank)

1(0-7) 42
1(0-7) 43

7.3 Do you prefer not to purchase publications written in a language you cannot read? 1 2 44

7.4 Gaps in the collection

7.4.1 Are there gaps in your information service's collection of the following sources? (1 → q.8) and if YES, when last did you experience a gap?

Monographs	2(0-7)	☐	45
Journals		☐	46
Abstract and index journals		☐	47
Dictionaries, directories and other reference tools		☐	48
Foreign language publications		☐	49
Other _____		☐	50

7.4.2 What is the effect of gaps in the collection of these information sources on

the acquisition of information?	3(0-5)	☐	51
the project	4(0-5)	☐	52

7.4.3 Are the gaps in the following types of information sources decreasing, remaining constant or increasing?

	D	C	I		
Monographs	3	2	1	☐	53
Journals	3	2	1	☐	54
Abstract and index journals	3	2	1	☐	55
Dictionaries, directories and other reference tools	3	2	1	☐	56
Foreign language publications	3	2	1	☐	57
Other	3	2	1	☐	58

7.4.4 Are the information sources not held by your information service held by other information services in the RSA? (YES = 7 → q.8) and if NO, what percentage of the information sources are not held by other information services in the RSA? 1(0-7) ☐ 59

7.4.5 When last was a publication you wanted to consult not in the RSA? 2(0-7) ☐ 60

8 Surplus publications

8.1 Does the information service contain surplus publications, i.e. little used unused, out of date or irrelevant publications? (2 → q.9) 1 2 ☐ 61

82. What is the effect of surplus publications on:

the acquisition of information?	3(0-5)	☐	62
the project?	4(0-5)	☐	63

8.3 Is the extent of surplus publication in the collection decreasing, remaining constant or increasing? D C I 3 2 1 ☐ 64

9 Quality of new acquisitions

9.1 Do you come across new acquisitions that contain the following types of information (1 → q.10.1) and if YES, when last did you come across such publications?

Repetitive information (already in the collection)	2(0-7)	☐	65
Inaccurate/out of date information		☐	66
Information from inferior research		☐	67

9.2 What is the effect of this type of information on:

the acquisition of information?	3(0-5)	68
the project?	4(0-5)	69

9.3 Is the extent of the following types of information in new publications decreasing, remaining constant or increasing?

	D C I	
Repetitive information (already in the collection)	3 2 1	70
Inaccurate/out of date information	3 2 1	71
Information from inferior research	3 2 1	72

10. Publishing and publications

10.1 Is there a surplus of published information?	1 2	73
10.1.1 What is the effect of surplus information on:		
the acquisition of information	3(0-5)	74
the project?	4(0-5)	75
10.1.2 Is the extent of surplus information decreasing, remaining constant or increasing?	D C I 3 2 1	76
	Blank	77
	Card 1	78
	Project 8	8
		79 80
10.2 Is there a shortage of quality information?	1 2	4
10.2.1 What is the effect of the shortage on:		
the acquisition of information?	3(0-5)	5
the project?	4(0-5)	6
10.2.2 Is the extent of the shortage of quality information decreasing, remaining constant, or increasing?	D C I 3 2 1	7
10.3 Do you know of important unconfidential research results that are not published, and if YES, is this a barrier?	1 2 3 4	8
10.4 Do you know of important published research results that are not included in abstracts or indexes, and if YES, is this a barrier?	1 2 3 4	9
10.5 Are there important keywords/terms used in your research subject that are not included in abstract and index journals/SDI services/thesauri, and if YES, is that a barrier?	1 2 3 4	10
10.6 Do you require access to detailed information?	1 2	11

10.7 Do the following provide access to detailed information, and if NO, is this a barrier?

	Abstract or index journals	1 2 3 4	☐	12
	Abstracts of articles in journals	1 2 3 4	☐	13
	Indexes in books	1 2 3 4	☐	14
	Computerized data bases	1 2 3 4	☐	15
10.8	Do you come across either incorrect or incomplete references (citations) in			
	journal articles?	1 2 3 4	☐	16
	abstract and index journals?	1 2 3 4	☐	17
	and if YES, is this a barrier?			
10.9	Do you experienced delays in the publishing of:			
	journal articles	1 2 3 4	☐	18
	conference proceedings	1 2 3 4	☐	19
	abstract and index journals	1 2 3 4	☐	20
	book reviews	1 2 3 4	☐	21
	and if YES, is this a barrier?			
10.10	Are relevant research results published in obscure/unexpected publications by publishers/booksellers, and if YES, is this a barrier?	1 2 3 4	☐	22
10.11	Do you come across inaccurate descriptions of new publications by publishers/booksellers, and if YES, is this a barrier?	1 2 3 4	☐	23
10.12	Are the important new publications in your research subject reviewed?	1 2	☐	24
10.13	What percentage of the reviews of new publications do you find reliable?	1(0-7)	☐	25
10.14	What percentage of the new publications on your research topic do you estimate is usable for your project?	1(0-7)	☐	26

C INFORMATION PROCESSING

11 Processing for the subject catalogue

11.1	Does the subject catalogue of the information centre provide access to detailed information? (YES = 7 → q.12) and if NO, what percentage of required access to detailed information can it provide?	1(0-7)	☐	27
11.2	What is the effect of limited access to detailed information in the subject catalogue on:			
	the acquisition of information?	3(0-5)	☐	28
	the project?	4(0-4)	☐	29
11.3	Is the accessibility to detailed information through the subject catalogue decreasing, remaining constant or improving?	D C I 1 2 3	☐	30

12 Publication in languages you cannot read

12.1 Do you come across important information in a language you cannot read? (NO = blank → 9.13) and if YES, what percentage access do you gain? 1(0-7) ☐ 31

12.2 When last could you not use information because it was written in a language you cannot read? 2(0-7) ☐ 32

12.3 What is the effect hereof on:

the acquisition of information? 3(0-5) ☐ 33
the project? 4(0-5) ☐ 34

12.4 Is the amount of foreign language information to which you are not gaining access decreasing, remaining constant or increasing? D C I 3 2 1 ☐ 35

13 General processing

13.1 Is the numbering system used for arranging books on the shelves of the information centre difficult to use, and if YES, is this a barrier? 1 2 3 4 ☐ 36

13.2 Are your sources dispersed among other subjects on the shelves, and if YES, is this a barrier? 1 2 3 4 ☐ 37

13.3 Are your sources dispersed among different libraries in your organization, and if YES, is this a barrier? 1 2 3 4 ☐ 38

D REFERENCE SERVICES

14 Sources and quality of reference services

14.1 Are interviews conducted to establish your information needs, and if YES, by whom? (no service = blank)

Subject specialist 1 2 ☐ 39
Head of information service 1 2 ☐ 40
Lending staff 1 2 ☐ 41
Order Department Staff 1 2 ☐ 42
Other _____ 1 2 ☐ 43

14.2 What percentage of all the references to published information

originates from your own initiative and reading? 1(0-7) ☐ 44
is initiated by the information service? 1(0-7) ☐ 45

14.3 What percentage of the references supplied are applicable (no provision = blank)

provided by the information service 1(0-7) ☐ 46
provided by yourself 1(0-7) ☐ 47

14.4 Do the identified references include references from

other relevant disciplines? 1 2 ☐ 48
the leading countries active in the same research? 1 2 ☐ 49
other languages? 1 2 ☐ 50

14.5	Are you certain that all the references to the important publication are identified by you or your information service? (Yes → q. 14.6)	1 2	51
14.5.1	What last did you find that not all the references were identified?	1(0-7)	52
14.5.2	Heat is the possible effect on:		
	the acquisition of information?	3(0-5)	53
	the project?	4(0-5)	54
14.5.3	Is the extent of references not identified decreasing, remaining constant, or increasing?	D C I 3 2 1	55
14.6	Do you reduce your use of your reference service because of one of the following reasons (no servoce = blank)	Yes No	
	Prefer to do my own searches	1 2	56
	Searching for references is part of the research process to be done by the researcher himself	1 2	57
	Subject specialist lacks searching strategy	1 2	58
	Subject specialist lacks subject knowledge	1 2	59
	Subject specialist not reliable/efficient	1 2	60
	Service provides too many irrelevant references	1 2	61
	Project is confidential	1 2	62
	Not familiar with the service	1 2	63
	Any other reason _____	1 2	64
14.7	Do you keep the information service fully informed of your information needs? (not applicable = blank)	1 2	65

E DOCUMENT DELIVERY

15 Timely availability

15.1	How frequently are the following available from the information service within the expected time?	
	New monographs in order	1(0-7) 66
	New journals in order	67
	Requests for information	68
	Requests for publications from	
	own information service?	69
	other information services in the RSA?	70
	overseas information services?	71

Blank	72-77
Card	2 78
Project	8 8
	79 80

15.2 When last did you experience a delay in the receipt of:

new monographs on order?	2(0-7)	4
new journals on order?		5
requests for information?		6
requests for publications from:		
own information service?		7
other information services in the RSA?		8
overseas information services?		9

15.3 What is the effect of a delay in the receipt of a document or information on:

the acquisition of information?	3(0-5)	10
the project?	4(0-5)	11

15.4 Is the extent of the delay in obtaining the following from the information service decreasing, remaining constant or increasing?

	D C I	
New monographs on order	3 2 1	12
New journals on order	3 2 1	13
Requests for information	3 2 1	14
Requests for publications from		
own information service?	3 2 1	15
other information services in the RSA?	3 2 1	16
overseas information services?	3 2 1	17

16 Interlendings

16.1 What percentage of your interlending request for publications/articles held by other libraries in the RSA are successful? 1(0-7) 18

16.2 What percentage of your requests reported as not available in the RSA do you request through international lending? 1(0-7) 19

16.3 What percentage of your international loans are successful? (not applicable = blank) 1(0-7) 20

17 Other topics

17.1 Do you come across publications on the shelves which are not in their correct sequence, and if YES, is this a barrier? 1 2 3 4 21

17.2 Are some of the publications of the information service missing when you request them, and if YES, is this a barrier? 1 2 3 4 22

17.3 Are some of the publications on loan when you request them, and if YES, is this a barrier? 1 2 3 4 23

17.4 Are some of the journals at the binders when you need them, and if YES, is this a barrier? 1 2 3 4 24

F GENERAL TOPICS

18 Have you yourself ever found important information later than when you needed it? 1 2 25

19 Have you ever unintentionally duplicated research (in part or whole) already performed? 1 2 ☐ 26

20 Awareness of information services

Which of the following facilities/procedures (1) have been explained to you by the information service (2) have not been explained but are known (3) are unknown to you (not applicable = blank)

	Expl. 1	Known 2	Unknown 3		
Procedure for recommending					
new books				☐	27
new journals				☐	28
The catalogue				☐	29
The arrangement of publications				☐	30
Abstracts and indexes on your subject				☐	31
Reference tools on your subject				☐	32
Accessions list of new publications				☐	33
Circulation of journals				☐	34
Circulation of contents pages				☐	35
Literature searching services				☐	
manual				☐	36
computerized				☐	37
How to find publications on the shelves				☐	38
Interlending facilities				☐	39
Photocopying facilities				☐	40
Microform readers/printers				☐	41

G ADDITIONAL BARRIERS

21 What other barriers obstructing the finding/handling/using of published information do you experience?

	42 43
	44 45
	46 47
	48 49
	50 51
	52 53
	54 55
	56 57
	58 59
	60 61
	62 63
	64 65
	66 67
	68 69
	70 71
Blank	72-77
Card	3 78
Project	8 8

APPENDIX 5: NINE BARRIER-RELATED COMMENTS, ALREADY IDENTIFIED FROM THE LITERATURE, IDENTIFIED BY SIXTEEN RESEARCHERS BY DIARY METHOD

The comments identifying the barrier are indicated in brackets,

- Barrier of publishing delay; (book reviews take a long time to appear).
- Barrier of obsolescent information; (information in new publications is out of date).
- Barrier of inferior information quality; (poor quality of information content of publications).
- Barrier of difficult to use information media; (unsuitability of media for prolonged use).
- Foreign language barrier; (translation facilities are lacking).
- Barrier of information congestion; (too much available information).
- Barrier of irrelevant information; (too much information supplied; required is the more accurate or reliable identification and evaluation of information based on scientifically founded selection criteria).
- Barrier of limited time (insufficient time to search for information; reading techniques learnt at school are inadequate to cope with the reading demands of today).
- Barrier of geographic distance; (excessive geographic distance from the information service).

APPENDIX 6: 143 BARRIER-RELATED COMMENTS SUBMITTED BY THIRTEEN MANAGERS OF LIS

BASIC FUNCTIONS

1 COLLECTION DEVELOPMENT

1.1 Publishing

- Strikes in the printing industry delay publishing.
- Publishers close down and ordered publications not issued; publiations sometimes taken over by another publisher and issued under a different format and series numbering, standing orders cancelled with take-over.
- High and increasing cost of publiations and information services.
- Markets by important publishers not locally represented.
- Private subscribers receive preferential treatment to institutional members with regard to mailing of publications.
- Too little and unsatisfactory advertising effort of some publishers.
- Limited editions printed.
- Important research results not published.
- Research results published in obscure publications.
- Limited distribution of research findings.
- Flood of publications.
- Low information value of many publications.
- Original and new research literature should be identified as such; only about eight per cent of new publications contain new research.
- Unnecessary duplicate publishing (same contribution in different periodicals).
- Unnecessary and expensive repackaging of information.
- Greatly differing usefulness/quality of information in publications, even within the same series.
- Delay before references in the primary literature appear in the secondary literature.
- Overlap in abstracts, indexes and databases in some diciplines contrasted with total lack of abstracts, indexes and databases for other disciplines.
- Pre-payment requirements before dispatch.
- General uncertainty about technological developments in the publishing industry, e.g. electronic publishing.
- Booksellers lack basic training and education.

1.2 Reviews and book reviews

- Book reviews not sufficiently descriptive and sometimes even misleading.
- Delays in issuing book reviews and review articles.
- Honesty in reviews.
- Overlap in book reviews and publisher lists.
- Lack of standardization in book announcements/reviews.
- References in book reviews missing or incomplete, e.g. series details or dates missing — this can lead to unnecessary duplicaation of orders.

1.3 Publications

- Media not condusive to use (michrofiche).
- Frequent splits and merges of periodicals, title changes.
- Lack of publication standards (important for bibliographic control).
- Inaccurate and incomplete bibliographic descriptions in references of books, journals, abstracts and indexes.
- Unstandardized references in publications.
- Poor printing and binding quality.
- Irregular series numbering.

1.4 Preselection, selection, acquisitions, evaluation, weeding and relegating

- No definitive acquisitions policy for expensive reference tools and publications.
- Lack of co-operation with regard to shared use and publicity of expensive reference tools.
- Distribution and accessibility of government publications.
- Acquiring publications from some African and certain other countries difficult or impossible.
- Publications boycott from some countries.
- High cost of airmail precludes the speedy acquisition of urgently required publications.
- Acquisition of government publications delayed because of dispersed distribution (by departments) and by pre-payment requirements.
- Reliable and recent listing of available South African government and other publications required.
- Deposit facilities and pre-payment facilities for overseas purchases unsatisfactory.
- Special subsidy or reduced tariffs required for handling and transfer of information.
- Local publishers do not always accept standing orders.
- Some societies distribute their publications only to members, thus in order to acquire a certain publication the information service has to take out membership.
- Extent of gaps in collection due to lack of subject knowledge of personnel of information services to be established.
- Appropriate subject education with regard to the subject speciality for which selection of new publications is made.
- Non-availability of important publications in South Africa.
- Delays in placing and executing orders for new publications.
- Mail losses of ordered publications.
- Postal strikes cause delays.
- Missing publications from information service.
- Obsolete bookstock.
- Selection of new publications can be improved if publications available on approval.
- Excessive delays in binding periodicals.
- High cost of obtaining publications through overseas bureaux.
- Import duty on publications and information — the handling and transfer of publications and information should enjoy preferential treatment and tariffs.

2 INFORMATION PROCESSING

- Delays in cataloguing, classification and indexing.
- High cost of processing.
- Confusion about level of subject cataloguing and indexing required.
- Too shallow level of subject-indexing.
- Ignorance and misplaced expectations of the advantage of SABINET.

3 INFORMATION RETRIEVAL AND REFERENCE

- Lack of South African information on databases.
- Limited access to databases on South African publications.
- Availibility of national/international term banks for compiling of indexes and thesauruses in Afrikaans and English.
- Lack of databases covering local information.
- Unnecessary duplication of research due to weak bibliographic tools.
- Inadequate bibliographic control of unpublished material.
- Macro-analytical versus micro-analytical retrieval.
- Advisory service at catalogue required.

- Improved service at catalogue required.
- Improve distribution of publisher catalogues.
- More periodicals to be displayed, better distribution and control of circulated periodicals or contents pages.
- Unbound periodicals not to be removed or issued on loan.
- Inadequate sifting of relevant from irrelevant information for the researcher who is over-supplied with information and references.

4 DOCUMENT DELIVERY
- Conflict between document delivery service and current awareness services.
- High cost of international interlending.
- Information services unwilling or reluctant to lend certain categories of publications (increasingly obvious with overseas libraries).
- Delays in interlending, especially international.
- Ignorance or not making use of new technologies to speed up document delivery, e.g. by telefacsimile.

SUPPORTING SERVICES

5 MANAGEMENT

5.1 Policy
- Fragmentary or non-existant national information policy.
- Lack of co-operative collection development policy for books, periodicals and audiovisual materials.
- Lack and problems in developing effective acquisitions and weeding policies (national and institutional).
- Lack of willingness to make internal databases available, e.g. national archives.
- Lack of national indexing standards.
- Lack of policy for national libraries.
- Method of financing and inadequate financing of national libraries in the RSA.
- Voluntary (instead of mandatory) nature of many co-operative schemes is detrimental to continuity and reliability.
- Confusion about centralization or decentralization of national information services.
- Overall low priority of libraries in the national budget.
- Unsatisfactory level on which top management of organizations place their libraries.

5.2 Practice
- Inability of managers of information services to feature prominently in their organization.
- Application of healthy and correct management principles required.
- Lack of measurement for work output.
- Lack of general knowledge and cultural insight to promote the library as a cultural centre of knowledge.
- Optimal use of manpower not realized.
- Lack of motivation and insight for the need for innovation, including computerization.
- Potential marketing of a positive and dynamic image of the information service in the day to day interaction with users not realized.
- Promotion of a pleasant professional atmosphere in the information service lacking.
- Improve co-operation between information service and the organization.
- Sub-standard service efficiency of information service.
- Consolidation of divisional libraries recommended.

- Cultural, lingual and subject knowledge differences between users and personnel of information service.
- Co-ordination between different divisions of the information service requires attention.
- Differing willingness to co-operate between information services of different organizations and some co-operation unsatisfactory.
- Lack of understanding of non-professional staff of the importance of efficient information services.
- Salaries of personnel not competitive.
- Lack of suitable professional (especially middle-management) and semi-professional personnel.
- Disparity in salary structures between types of libraries and individual institutions.
- Hierarchy in libraries limit the advance of professionals.
- Promotion opportunities limited.
- Acknowledgement of the aspirations of personnel in order to motivate them.

5.3 Personnel (including managers)

- Stereotype image of personnel.
- Academic background of recruits to the profession not always relevant.
- Lack of subject knowledge of librarians and information officers in the field of science and technology.
- Excessive fascination by high technology and by simple answers to complex problems.
- Lack of suitable personnel for middle- and senior-level management.
- Looking at issues, ad often voicing strong opinions on them from own small professional platform, based on education, training and experience. Are thus not interested in what others are doing because of possible conflicts with their own perceived professional reputation or advancement.
- Hidden motivations of individuals (or groups or even of organizations) are often much stronger barriers than the apparent, visible barriers.
- Ignorance of management of the high cost of processing (cataloguing, classification and indexing).
- Ignorance of management of the implications and the limitations of computerized systems.
- Personnel lack imagination and motivation.
- Personnel lack sense of urgency.
- Ignorance, unwillingness and even hostility of personnel.

5.4 Building

- Physical conditions and noise uncondusive to study and research.
- Allocated areas in building unsuitable for executing library world.
- Inadequate signs in the information service for guidance.
- Library frequently used for purpose other than for the retrieval and use of information and knowledge.

5.5 Public relations

- Inability of users to define and communicate their real information needs to the information service.
- Total ignorance by researchers of facilities and services offered by information services.
- Lack of understanding of problems experienced by personnel of information services.
- Ignorance of financial aspects of an information service.

6 EDUCATION, TRAINING, AND RESEARCH FOR THE PROFESSION

- Academic training partially or largely irrelevant.

- Academic training too theoretical.
- Insufficient attention in training programmes for managers and management.
- Neglect of developing basic skills in academic training, e.g. bibliographic skills.
- Unsatisfactory treatment of affective aspects of academic training.
- Desirability of including subject training with professional training.
- No or only few options to specialize available in education and training.
- Required is technical diploma over three years with 18 months practical work, with opportunity to specialize.
- Too little research conducted in librarianship and information science. The research that is conducted is largely too theoretical; applied research is needed.

APPENDIX 7: 24 BARRIER-RELATED COMMENTS IDENTIFIED BY THIRTEEN RESEARCHERS DURING THE PILOT STUDY

The following 24 comments, pertaining to six already identified barriers, were recorded during the pilot study in response to questions 6.2 and 21 of the questionnaire:

Barrier of unhelpful LIS procedure, rules and regulations

- LIS does not provide feedback of the reasons for excessive delays, or on problems experienced in executing requests, e.g. for interloans or for ordering new publications. Researchers have to take the initiative and make enquiries.
- Request for a copy of a new revised edition of a reference work was not approved by the LIS because it already held a copy of the superseded edition.
- Publications ordered for specific use by a certain department should be made available primarily to that department.
- No circulation of periodicals or contents pages.
- No accessions list compiled.
- The LIS and not the researcher decides on the number of periodicals or contents pages that may circulate.
- Permanent loans issued only for a month; should be issued for a longer period.
- Restriction on the number of loans and permanent loans.
- Researchers visiting other LIS should be able to take out publications even though they do not have the necessary interloan forms from their own LIS.

Barrier of unsuitable personnel

- Researchers not consulted on their information needs or service preferences.
- LIS personnel not sufficiently helpful.
- LIS staff not able to execute literature searches.
- LIS personnel do not their reference tools (in one case, a researcher had to explain to the librarian in charge the use of *Chemical Abstracts*. The next day the librarian who had received the instruction sent another researcher, who also wanted to know how to use that publication, to the researcher for instruction).
- Personnel not professional (one librarian was more interested in selling all kinds of products over her counter than in assisting the users).

Barrier of centralized information system

- Centralization of bookstock counterproductive. Centralization only justified for rare and valuable publications and if many users from different departments require the same publication. As a consequence of centralization:
  - the teaching and research function with publications has ceased the laboratory use of publications has changed to a museum function and publications are no longer used or recommended as frequently as before centralization;
  - cumbersome procedure to acquire laboratory publications on permanent loan discourages the use of publications;
  - whereas publications in the laboratory were frequently consulted for verification of facts and for checking bibliographic references, this is no longer possible and not done.

Barrier of inconsistent processing

- Illogical classification: Publications dispersed among other subjects and departments, e.g. bees with dairy products instead of entomology, gemstones with art instead of mineralogy.
- Incorrect classification: Two copies of the same publication carry different classification numbers.
- Different terms used for the same thing in the catalogue.

Barrier of processing delays

- Delay in placing orders for new publications has resulted in essential publications being sold out or being out of print by the time the order is received by the publisher.
- Do not use overseas interlending because these are slow; quicker to contact colleague overseas telephonically to send the required publication.

Barrier of inadequate indexing level

- Subject indexing for the subject catalogue too shallow.

APPENDIX 8: LAGS FOR JOURNAL ARTICLES, CONFERENCE PAPERS AND PROCEEDINGS, AND FOR ABSTRACT AND INDEX JOURNALS

1.1 Journal articles

Rejection lag

In their study of 3687 articles in the phsyical, social and engineering sciences, Garvey, Lin & Tomita (1972a:213-214) established that one manuscript in eight had been submitted to another journal prior to the publishing journal. Nine out of ten rejected manuscripts were accepted by the second journal, while six manuscripts were submitted to four or more journals before being accepted. Each rejection added on the average an additional lag of 12-14 weeks.

Garvey & Griffith (1971:358), in their study on the dissemination of research findings in psychology, reported that about one-fifth of the articles published in the main psychology journals were previously rejected by one or more journals.

On editorial revision of manuscripts, Roland & Kirkpatrick (1975:1275) mentioned that 38 % of the psychology journals were revisted once and 7 % twice. Garvey, Lin & Nelson (1970b:68), comparing rejection lags for manuscripts in the social and physical sciences, established that the interval between first submission, which resulted in rejection, and final submission, which resulted in publication, was seven months for the social sciences and three months for the physical sciences.

Publication lag

Stewart (1963:1004) reports an average lag of 7,5 months, while Pings (1967:181), investigating the delay in six chemical engineering journals, reports an average lag of about five months for two of the titles and an average lag of about 10-12 months for the other four titles. Yotoke & Utterback (1974:252-253) found lags ranging from 10 to 50 weeek with a calculated average lag of just over 24 weeks for their six neurology and nine general medicine journals. In his Euratom survey of 7763 articles in 260 scientific-technical journals, Meyer-Uhlenried (1967:228) calculated an average publication lag of six months, with a spread ranging from one month up to and exceeding 24 months. Garvey & Griffith (1971:358) report an average lag of nine months between submission and journal publication of manuscripts in psychology, and Garvey, Lin & Nelson (1970a:1166-1167) report a lag of about eleven months for the social sciences and about seven months for the physical sciences. Carson & Wyatt (1983:162) analysis of journals carrying articles on medical microbiology established a mean publication lag of 35 weeks with a range from 15 to 89 weeks for *Cancer Research* and *Zeitschrift für Allgemeine Mikrobiologie* respectively.

1.2 Conference papers/proceedings

Rejection lag

For the engineering, physical and social sciences, Garvey, Lin, Nelson & Tomita (1972:162-163) reports that 23 % of the manuscripts presented at meetings were not accepted by the first journal and about three-fifths were subsequently re-submitted to another journal. Comparing the communication patterns in the physical and the social sciences, Garvey, Lin & Nelson (1970a:1167-1168) report that about 14,0 % of the physical science manuscripts and about 40,0 % of the social science manuscripts were rejected by one or more journals during the first year after the meeting. This rejection delayed the publication of physical science contributions by about four months and those of the social science by about eight months. For the

combined sciences covered in the survey (physical, engineering and social), 23 % of the manuscripts presented at meetings were not accepted by the first journal and about 60 % were subsequently re-submitted to another journal (Garvey, Lin, Nelson & Tomita(1972:162-163).

Publication lag

The literature does not indicate the publication delay for separately published conference proceedings but only for conference papers included in journals, and this lag is the same as that for other journal contributions.

1.3 Abstract and index journals

Publication lag

On the time taken for articles published in a primary publication to be included in secondary publications, the literature provides the following statistics:

- Analysing the lag for twelve scientific abstracts Meyer-Uhlenried (1967:230-231) establishes that half the entries pertain to articles older than 6,5 months with a lag ranging from 4,5 months for *Computer Abstracts* to 11,1 months for *Referativny Zhurnal* (Chemistry), and an average delay of 8,5 months.
- Poyer (1982:143-144), analysing the time lag between receipt of the journal and the index in the information service for four indexing services, records avarage delays of 31 days for a journal to be included in *Current Contents: Life Sciences*, 110 days by *Science Citation Index*, 86 days by *SDLINE/MEDLINE*, and 129 days by *Index Medicus*.
- For an overview of the publication lags in *INIS Atomindex*, the International Atomic Energy Agency (IAEA) reports the following lags for books, journal articles, patents, reports, and miscellaneous items of 9 months for 1977, 8 months for 1980 and 10 months for 1986 (INIS Circular letter, 1978; 1981; INIS Information, 1986:Section 3:8).
- The mean time lag for papers abstracted in *Library and Information Science Abstracts* (LISA) was 3,8 months and for *Library Literature* 6,7 months (Turtle & Robinson, 1974:28) while Taylor (1971:474) reports that less than half the entries in the 1970 issues of *Information Science Abstracts* bore a date within a year of the publication date of the issue. Gilchrist & Presanis (1971:253) estimate delays of 99 days for *LISA*, 165 days for *Referativni Zhurnal* (English translation) and 427 days for *Information Science Abstracts*.

APPENDIX 9: 364 BARRIER-RELATED COMMENTS SUBMITTED BY 57 RESEARCHERS AT THE END OF THE INTERVIEW IN RESPONSE TO THE REQUEST TO IDENTIFY BARRIERS ADDITIONAL TO THOSE INCLUDED IN THE QUESTIONNAIRE

As mentioned in 5.23, these comments, except for those falling outside the cycle of published information (Figure 3), can be accommodated by the barriers previously identified. The number in brackets following the heading indicates the number of respondents that made the particular comment.

BOOKSTOCK DEVELOPMENT (74)

1.1 Barrier of unreliable reference tools (27)

- Required indexes in books are inadequate or are not included.
- Unaware of who else is working on the same topic, i.e. a lack of registers of research projects.
- Unawareness of local conferences, workshops and talks.
- Unaware of overseas visitors and their lecturing programme.
- Research projects are registered late. If they were registered early unnecessary duplication and replication of research might be avoided.
- SDI service cannot provide all the relevant references.
- References to relevant information not provided frequently enough by the LIS.
- The published *Research Bulletin* of the Human Sciences Research Council is too general, is inaccurate, with incomplete coverage and out of data information. Furthermore it does not provide abstracts.

1.2 Barrier of weak bookstock selection (19)

- It is evident that the acquisition or the cancellation of journal subscriptions is not co-ordinated amongst the various organizations. On the one hand journals which are not utilized clutter the shelves, while on the other hand important titles are cancelled without consultation: some of these are consequently no longer held by any LIS in the country.
- Lack of insight into the potential utility of a publication. It seems that publications are acquired that are either seldomly used or never used. Publications with a low utility potential should not be purchased but be acquired on interlending.
- There seems to be no sound method of deciding which new subscriptions to place. Some institutions decide by number of requests received for a particular title (to the disadvantage of the smaller departments), others by availability of funds. Also perturbing is the practice that in times of economic constraints, a standing subscription has to be cancelled when a new subscription is requested.
- The information service, without consulting the concerned researcher or department, proceeds to weed the collection. Without having the benefit of assistance of researchers knowledgeable on the contents of the publications concerned, the wrong publications are retained and discarded.
- Too often relevant research organizations are not identified and approached for their list of publications. The obtaining of blurbs is reactive rather than preactive. The soliciting and distribution of blurb appears to be unplanned. On the one hand many duplicates are received of the same blurb, while on the other hand some blurbs are not received.
- An opportunity to inspect publications on approval from publishers and bookdealers before purchase would help to improve the quality of new acquisitions and help to overcome the barrier of late and inaccurate book reviews. South Africa's geographical distance from overseas publishers and the size of its market are a definite disadvantage to implement such a scheme (such a scheme is however feasable, for the author implemented it at the University of the Witwatersrand).

1.3 Barrier of publication standards not applied (10)

- Author affiliation or position missing from articles.
- References not indicated in alphabetical author order but in sequence in which quoted.
- References and notes intermingled in the list of references, should preferably be presented separately.
- Titles of articles too vague and cannot always indicate the exact contents. A descriptive title is important, especially if no abstract is provided.

1.4 Barrier of incomplete coverage by abstract and index journals (9)

- Coverage of conference symposia and proceedings, foreign language publications, symbols and methods used, not complete.

1.5 Barrier of missing publications (4)

- Missing issues of journals are not replaced. This implies that the volume cannot be bound and the issues are kept on the shelves. Not being bound, they are not usually maintained in an orderly sequence, it becomes more difficult to find loose issues, and other loose issues also tend to go missing.

1.6 Barrier of incomplete or incorrect bibliographic references (3)

- References are sometimes incomplete and inaccurate, especially in theses and dissertations.

1.7 Barrier of inferior information quality (2)

- There is a too wide discrepancy of quality of contributions to the research literature. Until a contribution is inspected, the researcher remains unsure about its quality, relevance and pertinence.

INFORMATION PROCESSING (35)

1.8 Barrier of processing delays (18)

- Current issues of overseas subscriptions arrive late if not sent by air mail.
- Delays in getting interloans, especially from overseas.
- Delays in binding.

1.9 Barrier of inconsistent processing (7)

Inconsistent classification

- The same topic can be classified under different subjects, depending on which department ordered the publication.
- Some journals are bound with and others without the abstracts for the particular volume.
- Supplements not bound consistently; some titles are bound with the mother journal, others separately from the mother journal.

Inadequate processing of grey literature

- Pamphlets, catalogues and other grey literature are not indexed in depth; the collections are incomplete, are stored without sequence in pamphlet boxes and are housed in inaccessible and 'unknown' locations.

1.10 Foreign language barrier (6)

- Translation services are either lacking, ineffective, slow, or expensive.

1.11 Barrier of inadequate indexing level (4)

- In processing, the publication or carrier of information is over-emphasised while the information content is not attended to in sufficient detail, e.g. by micro-indexing.

REFERENCE AND INFORMATION RETRIEVAL (22)

1.12 Barrier of irrelevant information (14)

- A stronger selection of references required; too much irrelevant information is transmitted.
- Too many irrelevant references supplied.

1.13 Judicial barrier (6)

- Access to banned publications restricted. While some academic staff have access to banned publications, postgraduate researchers are denied access.
- Banned publications sometimes required not for their content but for the methods or approach used, but access cannot be obtained.

1.14 Barrier of limited time (2)

- Pressure of time does not allow sufficient time to search and handle information as thoroughly as it should; conflict between teaching and research at academic organizations.

DOCUMENT DELIVERY (5)

1.15 Barrier of difficult to use information media (5)

- Microforms are difficult and cumbersome to handle. At least the index or contents page should be in eye-readable printed form so that it is not necessary to continuously exchange the microfiche or microfilm.
- Microforms make poor copies on paper.

SUPPORTING FUNCTIONS (165)

1.16 Barrier of unhelpful LIS procedures, rules and regulations (83)

Unhelpful current awareness services (15)

- Journals not circulated.
- Circulation delayed for too long.
- Relevant and irrelevant journals circulated together. Journals applicable to only one department are sometimes circulated with those of a related department.
- Circulating service ceased without consulting or informing the recipients.

Lack of advisory services concerning orders for publications (11)

- The LIS does not always provide feedback on the position of orders, especially if these are delayed. All too often the researcher is not informed of the arrival of the ordered publication but is expected to pick this up through the list of new acquisition.
- There is also a lack of advising the researcher that certain orders were not placed or are kept back, e.g. because of a lack of funds. When funds do become available, the orders are placed without consulting the researcher to establish whether the delayed orders should still be excecuted (the request might have been satisfied by interlending) and whether the priority sequence of the orders has possibly changed.
- The LIS does not always consult or inform the researcher concerned about subscription cancellations.

Unhelpful binding procedures (8)

- Journals are bound while they are 'young' and in high demand.
- Binding not done annually, but several volumes bound at once so that a whole title cannot be consulted.
- Binding usually done during the university vacation, a time when many researchers are busy with research and require publications.
- No notice on the shelves that a certain volume or volumes are with the binders.

Unhelpful loan and renewal procedures (21)

- Reference publications may not be taken out on loan, not even for a few hours.
- Loan period of interloans sometimes too short; renewals not always granted.
- Requests for publications required on permanent loan not approved, even though no other department is interested in the publication.
- Publications required which are out on loan are not recalled until the loan period has expired. As the name of the borrower may usually not be disclosed, the researcher requiring the publication cannot approach the borrower directly.
- Reminders for overdue loans do not give author or title details but only the accession number of the overdue publication.
- Publications have to be physically returned to the information service for renewal. No telephonic renewals are permitted.
- Loans take a long time to be reshelved and are temporarily missing until shelved.
- Reminders are not sent to recall overdue publications and if they are sent the researchers do not respond to them 'because others also do not respond and once a publication is returned to the library, it is lost'.
- Since the records of loans was accidentally wiped blank, the LIS cannot determine who has what publication. Nor has it made an effort to either recall all publications for re-issue or hold an office-to-office stocktaking.

Unhelpful interloan procedures (8)

- No feedback on the position of requests or problems experienced in acquiring requested interloans.
- Interloan forms to be completed by the researcher.
- PISAL locations for requested items to be determined by the researcher.
- Recent publications, although listed in the Union Catalogue, are not available on interlending.
- Quality of illustrations on photocopies poor.
- High cost of interlending, especially from overseas.
- Relevance or usefulness of requested interloan uncertain until acquired.

Restricted access to other LIS (6)

- Access to the LIS of other organizations is difficult, cumbersome or not granted. Researchers should have access to all the relevant research organizations.
- If access is granted, no loan facilities are available, and the researcher usually has to apply for an interloan from his own LIS; nor may the publication be returned directly to the organization from which it was borrowed.
- Photocopying facilities at other institutions are not accessible on the same basis as they are at the own information service.

Lack of public relations (4)

- Users are not informed when the stock is moved or when services are discontinued.
- New staff are appointed or staff are rotated, without notice or introduction to users.
- Available facilities and services are not advertised or marketed.

Unhelpful opening hours (8)

- Opening hours at academic organizations unconducive to research, especially during vacations.

Modern technology not used (2)

- Modern technology should be utilized to the benefit of enhanced information processing for research, not merely to replace one inefficient system with another.

1.17 Barrier of unsuitable LIS personnel (45)

- Services of LIS at academic organizations primarily oriented towards undergraduates and not researchers. The LIS is not integrated with the research activity of the organization.
- Quality of subject specialists inadequate; not sufficiently qualified, professionally ignorant of information tools and how to use them, ignorance of the subject(s) which they are to serve. (While the researcher does not demand subject knowledge, he can expect an understanding of the subject from the subject specialist).
- Attitude and approach of personnel not supportive of research. Some LIS staff see themselves as clerical only, not involved in handling information. Approach is too often only reactive, not preactive. Some LIS staff see the researcher as a nuisance.
- Efficiency and accuracy lacking.
- Personnel do not communicate on matters of selection, processing (classification) or weeding.
- Personnel too busy, cannot cope with load.
- No subject specialists or too few provided.

1.18 Poor strategy for information searching barrier (20)

- Difficult to get references from related disciplines
- Difficult to identify and select the correct or the most suitable keywords for computer searches.
- Researcher does not always know what information is required and what information to look for.
- Difficult to decide or determine what information will become relevant at a later stage.

1.19 Barrier of ineffective organization of own research information and documentation (10)

- The researcher is ignorant of how to develop and maintain the own information system that supports research.

1.20 Barrier of complex arrangement and layout of the collection (5)

- Catalogues are too far away from the shelves.
- Floor plans are lacking, shelves not marked.
- Journals arranged by subject and not by alphabetical sequence.
- Researchers require privacy in the LIS.

1.21 Barrier of high cost of publications (2)

- High charges for SDI reference services.

BARRIERS OUTSIDE THE PUBLISHED INFORMATION CYCLE (63)

The following barriers pertain to barriers that researchers experience outside the LIS environment and in the research infrastructure. Although these barriers do not form part of the project, they are also listed because they are considered important and revealing.

Lack of research assistant (20)

- A departmental research assistant is required to assist information searching and handling. Can also maintain or help to maintain the researchers' or departments information system.

Infrastructure unconducive to research (19)

- Research results not implemented.
- Researchers do not work together.
- Closely integrated infrastructure for research lacking.
- Local research tries to compete with overseas research. It should rather concentrate on our own unique situation.
- Isolation from overseas information sources and expertise due to great geographic distances; difficult and expensive to attend overseas conferences.

Publishing research results (16)

- Pressure to publish dictates that there is sometimes too little time to check facts.
- Page costs associated with publishing in some journals.
- Political boycott of contributions of South African authors in overseas periodicals suspected. Thus journals which adopt the 'blind review' are preferred, alternatively overseas affiliations are adopted.
- The present subsidy formula which stipulates that contributions to only one or to only a few journals in a particular discipline are entitled for subsidy, has concentrated contributions on those titles and caused publishing delays.
- As some disciplines do not have an own professional journal, the researcher has to publish in a related discipline.
- The available local outlets for articles might not be able to cope with the number of contributions for publication. The researcher has to either accept a publishing delay or publish in the journals of related dissiplines.
- Researchers require assistance with the compilation of an index for their publication(s).

Limited production, distribution, and publicity of research reports (5)

- Limited editions printed, which are soon out of print.
- Limited distribution of research reports.
- Limited publicity of new research reports and government publications.

Too few review articles are compiled (3)

- Not only are too few review articles published, but those that are published are of poor quality, presenting a rehash rather than an overview or evaluation. This might be caused, among other reasons, by the approach that review articles are not considered as a research publication.

BARRIERS ARRANGED IN ORDER OF THE NUMBER OF TIMES MENTIONED

Barriers in the cycle of published information in research (301)

Barrier of unhelpful LIS procedures, rules and regulations (83)
Barrier of unsuitable LIS personnel (45)
Barrier of unreliable reference tools (27)
Barrier of processing delays (18)
Barrier of weak bookstock selection (19)
Barrier of irrelevant information (14)
Barrier of publication standards not applied (10)
Barrier of ineffective organization of own research information and documentation (10)
Barrier of incomplete coverage by abstract and index journals (9)
Barrier of inconsistent processing (7)
Foreign language barrier (6)
Judicial barrier (6)
Barrier of complex arrangement and layout of the collection (5)
Barrier of difficult to use information media (5)
Barrier of inadequate indexing level (4)
Barrier of missing publications (4)
Poor strategy for information searching barrier (20)
Barrier of incomplete or incorrect bibliographic references (3)
Barrier of limited time (2)
Barrier of inferior information quality (2)
Barrier of high cost of publications (2)

Barriers outside the cycle of published information in research (63)

Lack of research assistant (20)
Infrastructure unconducive to research (19)
Publishing research results (16)
Limited production, distribution, and publicity of research results (5)
Too few review articles compiled (3)

APPENDIX 10: BARRIERS EXPERIENCED BY THE COMPILER WHILE CONDUCTING THE RESEARCH PROJECT

As indicated in 1.1.2.5, the author thought it instructive to keep a record of the barriers experienced while conducting this project. Thirteen barriers covered by the project were experienced, as well as some irritations. These are briefly described. Their frequency, if recorded, is indicated in brackets.

Barrier of information scarcity
The literature reports very little evidence of the presence of barriers and even less on the seriousness of barriers. Although this substantiates the need for the project, it precludes a comparison between the data collected from the literature and the data collected from the target group.

The majority of the contributions on the seriousnes of barriers are possibly dated. The absence of newer data precludes a comparison with the data collected from the target group. Some statistics could be updated by correspondence.

A lack of contributions to the literature on research LIS serving the researcher - (much more seems to have been written about LIS services to undergraduates).

Data gathered from use and user studies strictly speaking relates to LIS users and does not represent the barriers encountered by non-users. As such barriers might be the reason for non-use, the use and user studies cannot fully reflect all the barriers experienced.

Barrier of information congestion
At least 1200 articles or publications were consulted for the project. This number excludes the references supplied by SDI searches and gives an idea on the extent of potential publications. The number of consulted items would have been higher if the cost for overseas interloans was lower (only one such request was made), and if the abstracts in abstract journals were not so shallow as to preclude an adequate indication of the relevance and usefulness of publications for the project. Of the 1200 items consulted, only about 380 were used in the text and included in the list of references quoted. Thus while there were too many publications, they had to be consulted because there were really too few that conveyed usable information.

Barrier of incomplete or incorrect bibliographic references
Lack of references to source of information (6).
Seriously incomplete references (2).
Incorrect references in articles (8), in abstract and index journals (8), and in publisher's blurbs (2).

Barrier of information published in obscure publications
References quoted contributions in obscure publications not commercially published (4).

Barrier of gaps in the collection
Interlending requests not in the RSA (58).
Articles could not be supplied because only the current issues of the periodicals are retained, the back copies being discarded (3).

Political-ideological barrier
No reply received for requests for more details from authors in the Scandinavian countries. Similar requests from the United States of America were fulfilled.

Barrier of inadequate indexing level
The term 'barrier' not being indexed, it could not be used as a search point and it was difficult to find the appropriate keywords. Due to this many publications had to be scanned in the hope that they might contain some details on barriers. This certainly substantiates Weinberg (1988) that indexes fail because they focus on aboutness and neglect the aspect, and that they do not work for aspects of a general topic not easily named in distinctive terms.
Related to indexes are abstracts, which were generally found to be too shallow. At least forty international interloans were not applied for because of the vagueness of the abstract and the uncertainty of relevance. Admittedly, the high cost of international interloans was a contributory factor. Also, because of shallow abstracts, fuller details were requested by letter from four authors whose publications could not be obtained.

Foreign language barrier
Foreign language publications that could not be understood (4). This figure should be much higher, as not all the required foreign language publications were requested (about 20) but only the important ones which hopefully contained either an abstract in English, German, or Dutch, or contained statistical tables, formulae or diagrams.

Barrier of irrelevant information
The computerized *DIALOG-LISA* searches for relevant references did not yield any contributions of value for the project. Two searches at a cost of several hundred Rand supplied 300 references, of which 33 articles were consulted, all of them irrelevant.

Barrier of missing publications
- Required publications missing from the shelves of the own LIS (8).
- Interlending requests that could not be satisfied because the requested publications were missing (15).

Barrier of unhelpful LIS procedures, rules and regulations
- Publications out on loan not available until the loan period has expired. Contact with the borrower to determine whether the publication could be quickly consulted not encouraged (3).
- No access to other LIS facilities granted if not a registered member.
- High charges for interloans (2). As the relevance or usefulness of the required document is not known, the charge becomes a determining factor.

Barrier of unreliable reference tools
Requested publications could not be verified bibliographically by the interlending service. This is due to inadequate access points in, and incomplete coverage of the local union catalogues, and not due to gaps in the collection (19).

Barrier of processing delays
Without being unreasonable, excessive delays were experienced with the ordering of only one new publications and with two local interloans.

Other minor barriers and irritations

- Methodological and statistical deficiencies in the literature, e.g. number of respondents involved in surveys not mentioned (4).
- Plagiarism in articles and thesis (4).
- Incomplete photocopies supplied, text missing (7), or pagination details cut off (2).
- Photocopies supplied with text or pagination cut off (2).
- Interlending requests could not be supplied because: requested item available for reference only (4); presently in use (2); required publications reported as not held by LIS, when in fact it was in stock (2).
- Publications held in the LIS not recorded in the *Union Catalogue of Monographs*.
- Publication returned to the shelves without the reserve instruction being followed (1).

The seriousness of these barriers and irritations were not determined, but their effects covered a wide range, from 'no effect' to 'eliminating accessibility to information'. None of the barriers were serious enough as to decrease the quality of the project, though this is difficult to ascertain, e.g. in cases where relevant publications could not be obtained. That some of the other barriers are not recorded does not imply that they were not experienced.

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